Spectrum Efficiency in Scotland

Study Proposal

National Grid Wireless

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Prepared for: Ofcom
Prepared by: National Grid Wireless

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1 EXECUTIVE SUMMARY

Compared with the rest of the UK, Scotland is geographically remote from Ireland and the Continent and Scottish stations have little interaction with UK sites in England and Northern Ireland. Consequently there is potentially more spare spectrum in Scotland than elsewhere in the UK. Initial investigation of the use of standard channel groups across Scotland has shown that there is potential to release five channels, channels 30, 48, 51, 52 and 56 in Scotland for use by additional services. These channels are presently assigned within the v5.61 UK plan to nine relay stations and one main station, Rumster Forest.

A search for channels based on standard channel groups showed that for all ten stations alternatives were available that provide an equivalent service to those proposed within the v5.61 UK plan.

Re-channelling the affected stations releases five UHF channels for use for alternative services. An assessment has been carried out of the coverage of two scenarios.

1. Assigning the released channels to the fourteen main DTT stations to form an additional Scottish layer.
2. As 1 but with a second channel assigned to Black Hill and Craigkelly creating a second layer serving the Glasgow/Edinburgh corridor.

Coverage predictions indicate that the fourteen stations using a 64QAM 2/3 modulation scheme should be serve approximately 84% of Scottish households (2 million households). The additional second layer at Black Hill and Craigkelly has the potential to reach 1.2million households about 52% of the Scottish population.

On the whole the changes to the v5.61 plan could be implemented with little interaction with Ireland and the Continent. The changes required at Rumster Forest mean that signal levels of the proposed new COM multiplex on the Norwegian coast would be between 25 dBµV/m and 28 dBµV/m. All the other changes do not affect the GE-06 plan.

Use of the five released channels requires restriction at a number of sites to limit interference to 23 dBµV/m towards Ireland and the Continent. In all cases other than Black Hill these restrictions can be met using the main DTT antennas and limiting the ERP – whilst providing a reasonable service. At Black Hill as the main restriction lies over the Glasgow metropolitan area and to provide a service across Glasgow - interference towards Ireland (Donegal) will exceed the 23 dBµV/m level by about 6dB.

In summary it appears that for a small amount of additional work there is the potential to release five interleaved channels in Scotland without affecting the coverage of the six main multiplexes.

2 INTRODUCTION

NGW have identified that five channels, channels 30, 48, 51, 52 and 56, that are lightly used in Scotland could be, with a little careful re-planning, released for use by other applications.

To assess what could be achieved following a re-plan a short study has been carried out. The purpose of this study being to;

- Assess what the impact would be to the v5.61 plan as a result of re-channelling stations using these channels in Scotland.
- Calculate the coverage that could be achieved by an additional service(s) if these channels were re-allocated for use by the primary sites across Scotland.

This report summarises the findings of this study.

3 METHODOLOGY

The aim of this exercise is twofold. Firstly to re-channel the Scottish stations using channels 30, 48, 51, 52 and 56. The second being to assess the coverage that could be achieved by these released channels if used to create additional DTT layers. Planning work has been based on v5.61 of the UK plan.

When re-channelling the affected stations, the aim has been to

- Maintain coverage within the analogue PSA where the PSA is seen as representing the coverage of the station concerned.
- Stay within the existing channel group
- Avoid difficult RBL solutions

As part of the second half of this study, creation of additional DTT layers, station parameters and coverage have been assessed on the following basis

- Attempt to limit interference to the Continent and Ireland to 23 dBµV/m
- Limit the maximum ERP to 7dB below the PSB multiplexes, i.e. a nominal 14dB below analogue ERP
- Use a pragmatic approach to channel allocation, i.e. if a DSO channel interacts with another station then to equalise interference a new channel can also interact with the same station. Note this approach is not as restrictive as that adopted for the Local TV study carried out by NGW on behalf of Ofcom.
- Assess coverage on the basis of a 64QAM 2/3 modulation scheme

At the time the study was proposed to Ofcom, ten stations in Scotland used channels 30, 48, 51, 52 and 56. Five of these stations were subsequently re-channelled as part of an exercise by the planners for Scotland, Arqiva and the BBC, to allocate channels to stations based on standard channel groups.

4 CHANGES TO THE V5.61 PLAN

Within the UK v5.61 plan only one main station and nine relays use channels 30, 48, 51, 52 and 56 in Scotland. Careful re-working of the channel plan can release these channels for use by other applications across Scotland without materially damaging the core coverage of the main multiplexes. Proposed alternative channels for the stations in question are shown in Table 1.

No	Station	PSB1	PSB2	PSB3	COM4	COM5	COM6	Comments
14800	Rumster Forest	21	24	27	55 (30)	59	62	
10508	Cathcart	53 (48)	57 (52)	60 (56)	-	-	-	Analogue conversion
10538	Kirkfieldbank	55 (48)	59 (52)	62 (56)	-	-	-	
10566	Kelvindale	55 (30)	59 (48)	62 (52)	-	-	-	Operate as an SFN with Glasgow West Central
13403	Fitful Head	41 (48)	44 (51)	47 (52)	-	-	-	Changed by the BBC as part of standard groups
13406	Baltasound	43 (43)	46 (45)	50 (48)	-	-	-	Changed by the BBC as part of standard groups
15226	Ardnadam	42 (48)	45 (52)	49 (56)	-	-	-	
13407	Fetlar	41 (41)	44 (51)	47 (52)	-	-	-	Changed by the BBC as part of standard groups
15410	Ullapool	42 (45)	45 (49)	49 (52)	-	-	-	Changed by the BBC as part of standard groups
15416	Tarbert Harris	42 (45)	45 (49)	49 (52)	-	-	-	Changed by the BBC as part of standard groups

Table 1: Proposed channels for stations in the v5.61 plan that use channels 30, 48, 51, 52 and 56

For modelling coverage a new UK plan tentatively numbered v5.62 based on these changes has been created.

4.1 Station Changes

4.1.1 Rumster Forest

The commercial multiplexes COM5 and COM6 are assigned channels 59 and 62. Commercial multiplex COM4 is assigned channel 30. The reason planners did not use a standard group at Rumster Forest for the commercial multiplexes (ch 55, 59 62) was to keep COM4 in group. Rumster Forest is a Band IV station and existing SDN multiplex is in group and uses ch32. Assigning COM4 to ch30 meant it stayed in group.

However, as viewers of existing DTT will have had to use wideband antennas to watch multiplexes C & D, ch62 and ch59 respectively, and viewers post DSO will need wideband antennas to continue watching these two multiplexes there seems little reason why COM4 should be allocated ch30.

To clear channel 30 at Rumster Forest it is proposed that all the commercial multiplexes use the standard channel group 55, 59 and 62. The proposed change would help equalises interference on this channel group across Scotland. The impact of the change is small thought there is a small a loss in 6Core coverage of 2 households within the APSA, Table 2 and Figure 1 (note the loss is not visible), though COM4 coverage falls the gross 6Core coverage improves by 532 households.

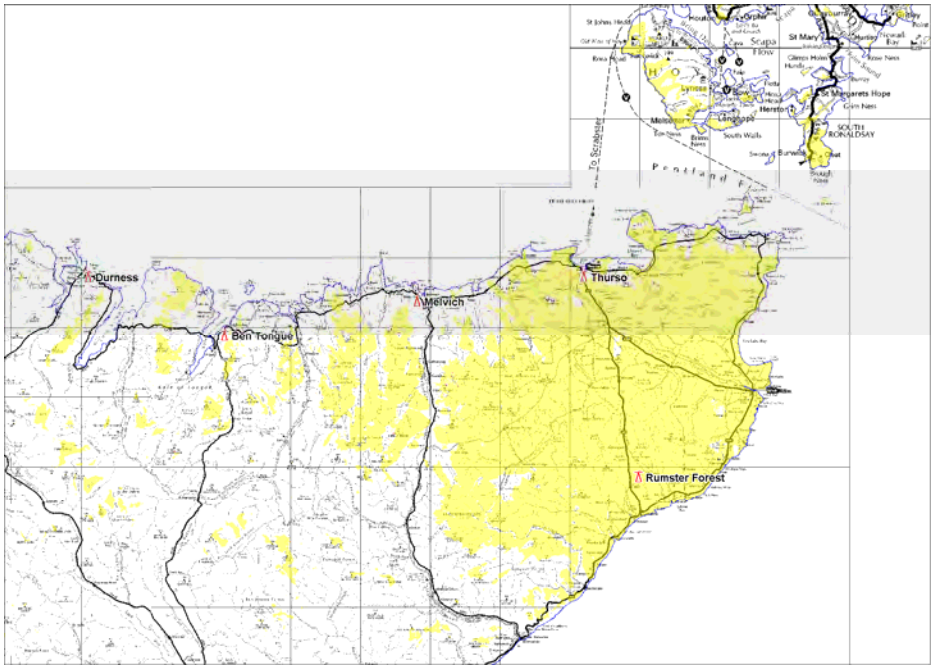


Figure 1: 6Core coverage comparison between v5.61 plan and proposed plan within the APSA

	PSB1	PSB2	PSB3	COM4	COM5	COM6	3PSB	6Core	FoM
V5.61	71,872	68,321	67,589	64,705	49,008	48,936	67,494	47,458	19,068 (96%)
V5.62	71,872	68,321	67,589	53,604	49,008	48,936	67,494	47,990	19,066 (96%)

Table 2: Gross coverage of Rumster Forest pre and post re-channelling and within the APSA

4.1.2 Cathcart

The number of relays within the Glasgow metropolitan area, mean that spectrum is scarce. Cathcart analogue presently operates on chs 53, 57, 60 and 63. To improve coverage post DSO, JPP planners have moved Cathcart to channels 48, 52 and 56. Though these channels do provide better coverage, the coverage achieved is arguably better than that required to serve the deficiency Cathcart was designed to cover. To clear channels 48, 52 and 56 it is proposed to keep Cathcart on its existing analogue channels, 53, 57 and 60. This will put Cathcart co-channel with Rosneath COM multiplexes – a relationship that presently exists between Cathcart analogue and Rosneath existing DTT. As the COM ERP at Rosneath will increase post DSO, to minimise the loss within Cathcart's APSA, it is proposed that the ERP is increased by 6dB. This increase is in line with the power increase at the station when co-channel DTT services were introduced at Rosneath. As this channel relationship will continue post-DSO the ERP increase nominally maintains the status quo. However, even with the ERP increase, though gross coverage increases, there is some loss predicted across the APSA. In the case of Cathcart it is believed that the APSA covers a far greater area than the deficiency the relay was designed to serve, Figure 2.

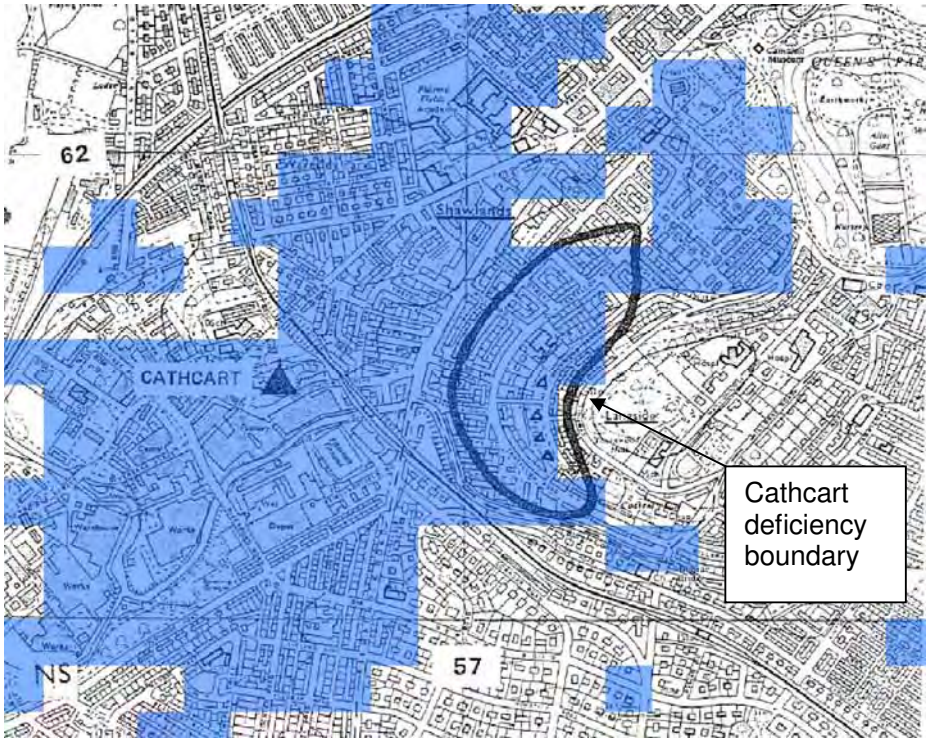


Figure 2: 3Core coverage within the APSA of the proposed channels at Cathcart with respect to the station target area

	PSB1	PSB2	PSB3	3PSB	FoM
V5.61	75127	64028	72150	56330	8799 (98%)
V5.62	108076	107486	118781	106643	8111(91%)

Table 3 : Gross coverage of Cathcart pre and post re-channelling and within the APSA

4.1.3 Kirkfieldbank

Kirkfieldbank analogue uses channels 53, 57 and 60. Post-DSO to improve coverage of the relay JPP planners assigned channels 48, 52, 56 to the station. Analysis of potential alternative channels has shown that channels 55, 59 and 62, though providing slightly lower gross coverage, serve the entire APSA.

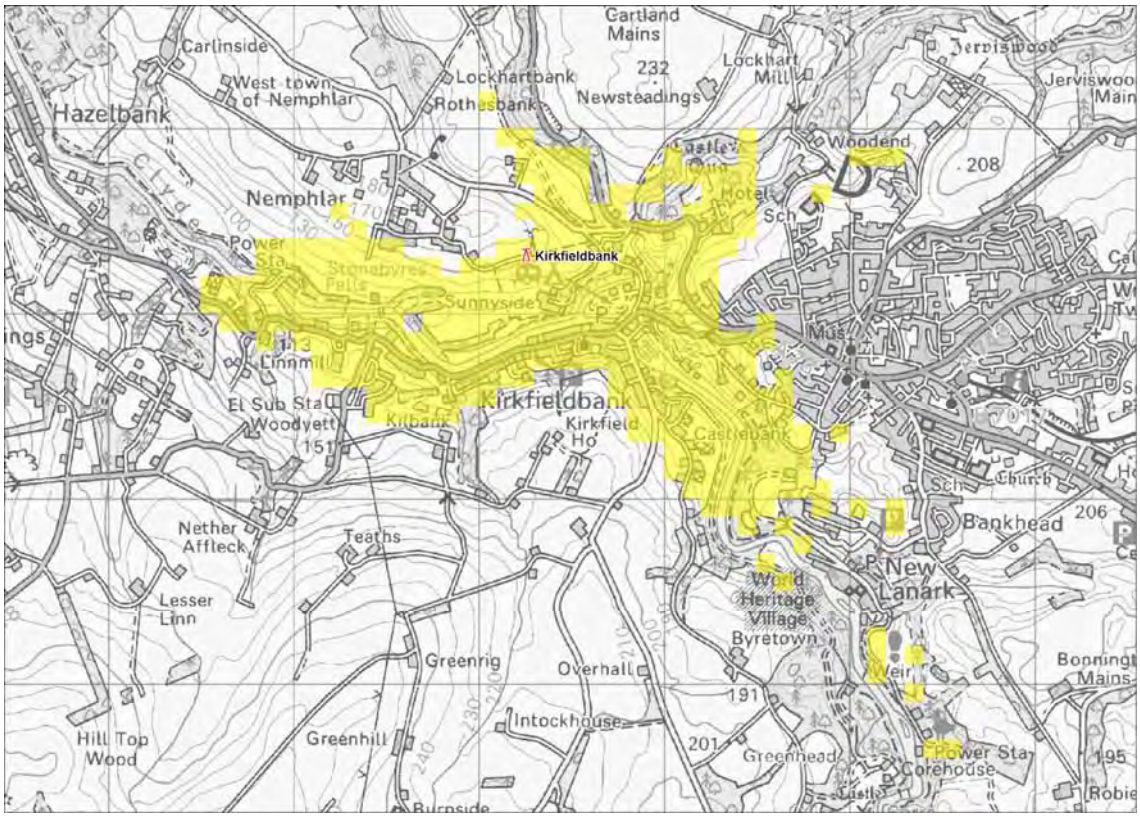


Figure 3: 3Core coverage comparison between v5.61 plan and proposed plan within the APSA

	PSB1	PSB2	PSB3	3PSB	FoM
V5.61	2898	2945	3016	2898	525 (100%)
V5.62	2603	2579	2578	2578	525 (100%)

Table 4 : Gross coverage of Kirkfieldbank pre and post re-channelling and within the APSA

4.1.4 Kelvindale

There are no channels available in Glasgow within the existing channel group that could be readily used to re-channel Kelvindale. Consequently to preserve spectrum within the area and to ensure and in-group solution is provided it is proposed that Kelvindale should be made co-channel with Glasgow West Central with the two stations operating as part of a SFN. The two sites lend themselves to be part of a SFN as they are both RBL fed from Black Hill and are separated by less than 1.4km, well within the 8km guard interval proposed for the main DTT multiplexes. Though there is an apparent reduction in the gross coverage most of this occurs in overlap areas with Glasgow West Central (the SFN model allocates coverage to one or other of the stations). The coverage within the APSA improves.

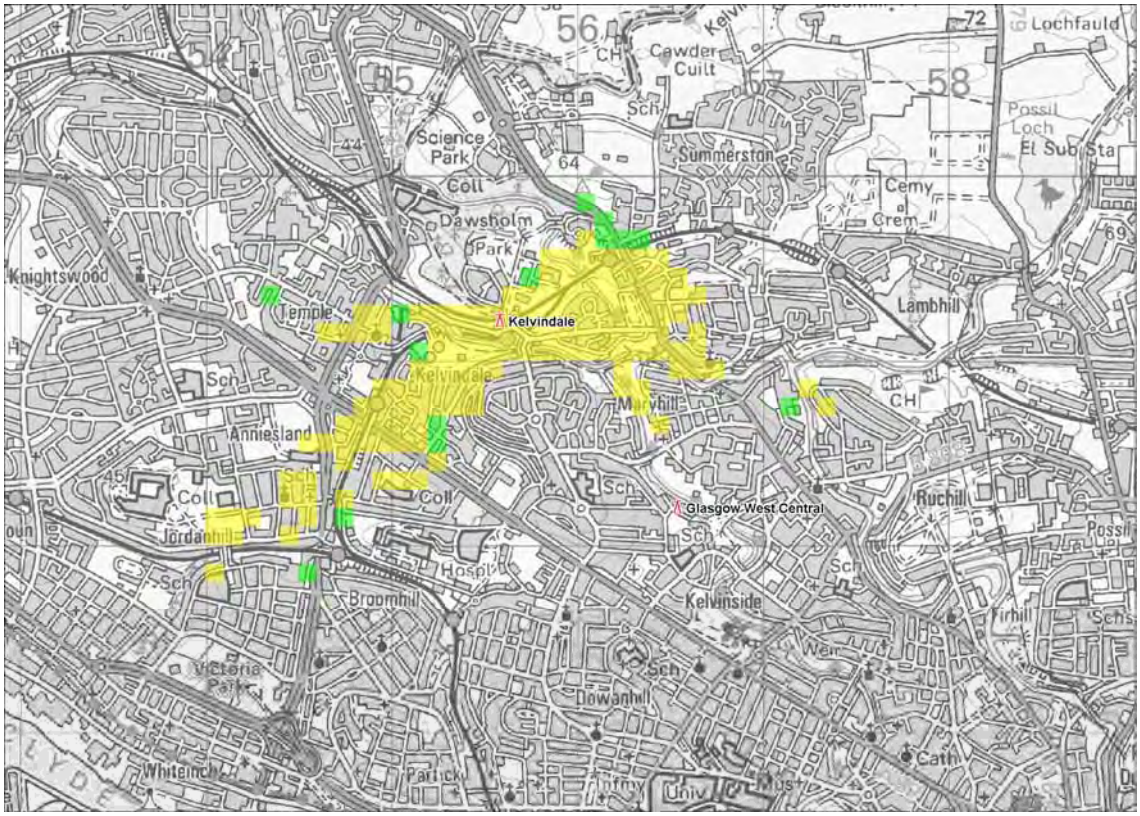


Figure 4: 3Core coverage comparison between v5.61 plan and proposed plan within the APSA

	PSB1	PSB2	PSB3	3PSB	FoM
V5.61	26796	11895	11650	10435	2920 (91%)
V5.62	7059	6864	6795	6752	3107 (97%)

Table 5 : Gross coverage of Kelvindale pre and post re-channelling and within the APSA

4.1.5 Ardnadam

Use of standard channel group 42, 45 and 49 at Ardnadam provides an increase in gross coverage of some 1,300 households and more even coverage across all the multiplexes. The FoM also improves.

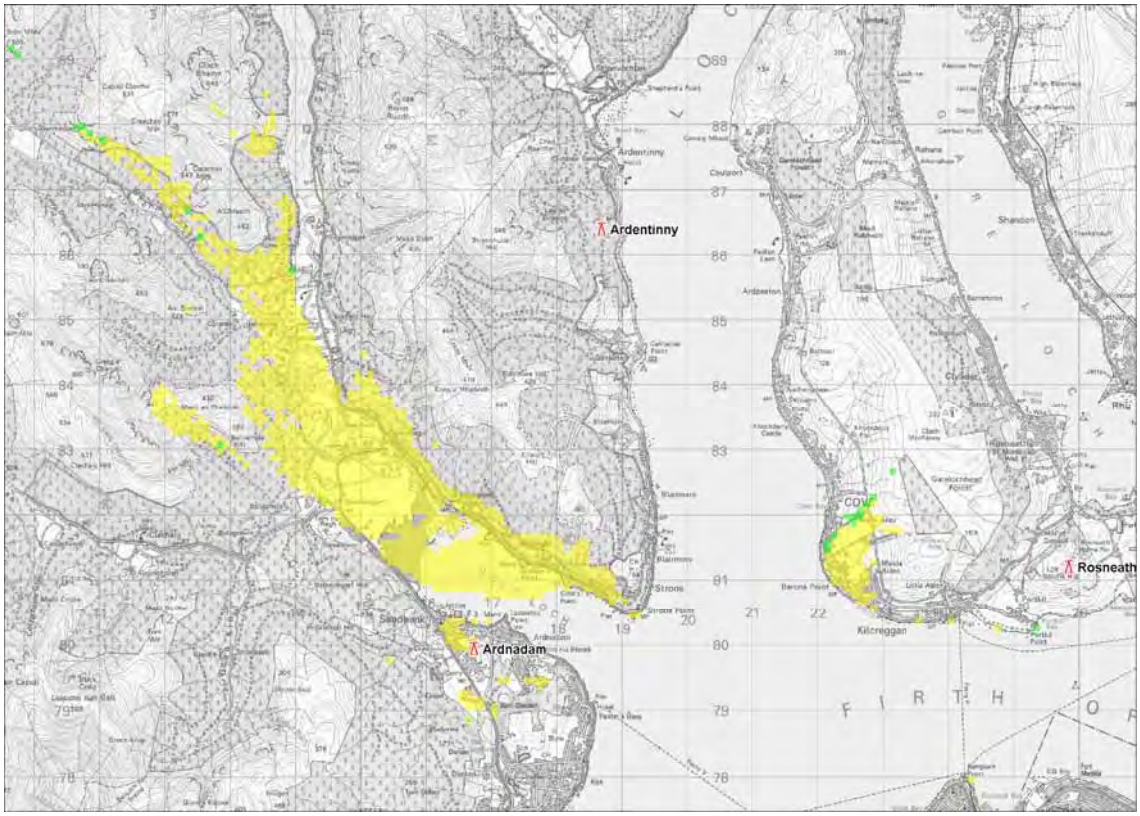


Figure 5: 3Core coverage comparison between v5.61 plan and proposed plan within the APSA

	PSB1	PSB2	PSB3	3PSB	FoM
V5.61	6627	4541	4541	4541	633 (96%)
V5.62	5911	5905	5901	5882	658 (100%)

Table 6 : Gross coverage of Kelvindale pre and post re-channelling and within the APSA

4.1.6 Standard Group Stations

The relays at Fitful Head, Baltasound, Fetlar, Ullapool, Tarbert Harris have all been re-channelled by the JPP. Coverage of these sites is subject to optimisation by the JPP.

4.1.7 Summary

Re-channelling of the main station and relays using channels 30, 48, 51, 52 and 56 can be done with little impact to the UK plan. In several cases coverage is improved.

Based on an ITU-R 1546 assessment the channel change at Rumster Forest will need to be co-ordinated with Norway. Using the main DTT antenna Rumster Forest operating at 20kW exceeds the 23 dBµV/m threshold on the Norwegian coast by approximately 5dB. COM operators have indicated that they intend to operate Rumster Forest at 10kW ERP. Such an ERP from the main DTT antenna will result in a field strength of approximately 25 dBµV/m on the Norwegian coast.

5 ADDITIONAL LAYERS

The five cleared channels offer a great deal of flexibility as to their use across Scotland. In terms of bandwidth this released spectrum is arguably equivalent to that allocated to a full power commercial multiplex. In fact, if a pragmatic approach to planning were adopted, other than limiting interference towards Ireland and the Continent there is nothing to stop these channels operating at power levels equivalent to the Commercial multiplexes.

Given the requirement to limit interference to Ireland and the Continent the potential coverage of two scenarios has been explored.

1. A single layer using all five channels + channel 21 at Caldbeck

2. As scenario 1 but with two layers at Black Hill and Craigkelly the two stations serving the Glasgow and Edinburgh corridor.

To demonstrate the potential of the spectrum, planning has nominally been based on use of the main DSO antennas[1]. The ERP at each site is either -14dB relative to analogue, or lower depending on the restrictions imposed by need to limit interference to Ireland and the Continent, Table 7.

In the case of Black Hill, Darvel, Eitshal, Torosay and Rosneath, ITU-R field strength calculations to a small part of Ireland shows that significant restrictions are required which may preclude the use of the main DTT antennas. For the purpose of this exercise all stations have been limited to a nominal 23 dBµV/m on the Irish coast other than Black Hill. As the main restriction to Black Hill is directly over the Glasgow metropolitan area it was considered necessary to exceed the restriction. Black Hill operating at 5kW ERP from the main DTT antenna, puts down approximately 30 dBµV/m to parts of the Irish coast. It has been

[1] Access to sites and availability of antenna systems, i.e. whether the antenna systems have the capability to handle the channels at the proposed ERP, would need to be confirmed with the site Landlords, Arqiva and NGW.

assumed that over the small arc Black Hill exceeds 23 dBµV/m agreement could be reached with Ireland without prejudicing coverage across the rest of the United Kingdom.

Number	Ch	ERP dBW	Station
10500	51/52	37	BLACK HILL
10510	30	24	TOROSAY
11200	30	40	DURRIS
12300	52	36	ANGUS
13400	48	36	KEELYLANG HILL
13402	30	24	BRESSAY
14700	48/30	36	CRAIGKELLY
14800	52	36	RUMSTER FOREST
15200	30	23	DARVEL
15211	56	24	ROSNEATH VP
15300	56	36	KNOCKMORE
15400	30	31	EITSHAL
15600	48	34	ROSEMARKIE
16100	56	33	SELKIRK
16500	21	30	CALDBECK (Scotland)

Table 7: Maximum ERP of additional channels.

6 RESULTS

Coverage achieved by the Scottish additional layers 1 and 2 is shown in Figures 8 and 9 and Table 9.

Coverage is based a 64QAM 2/3 FEC modulation scheme, the ERP shown in Table 7 and use of the main Post-DSO DTT antenna.

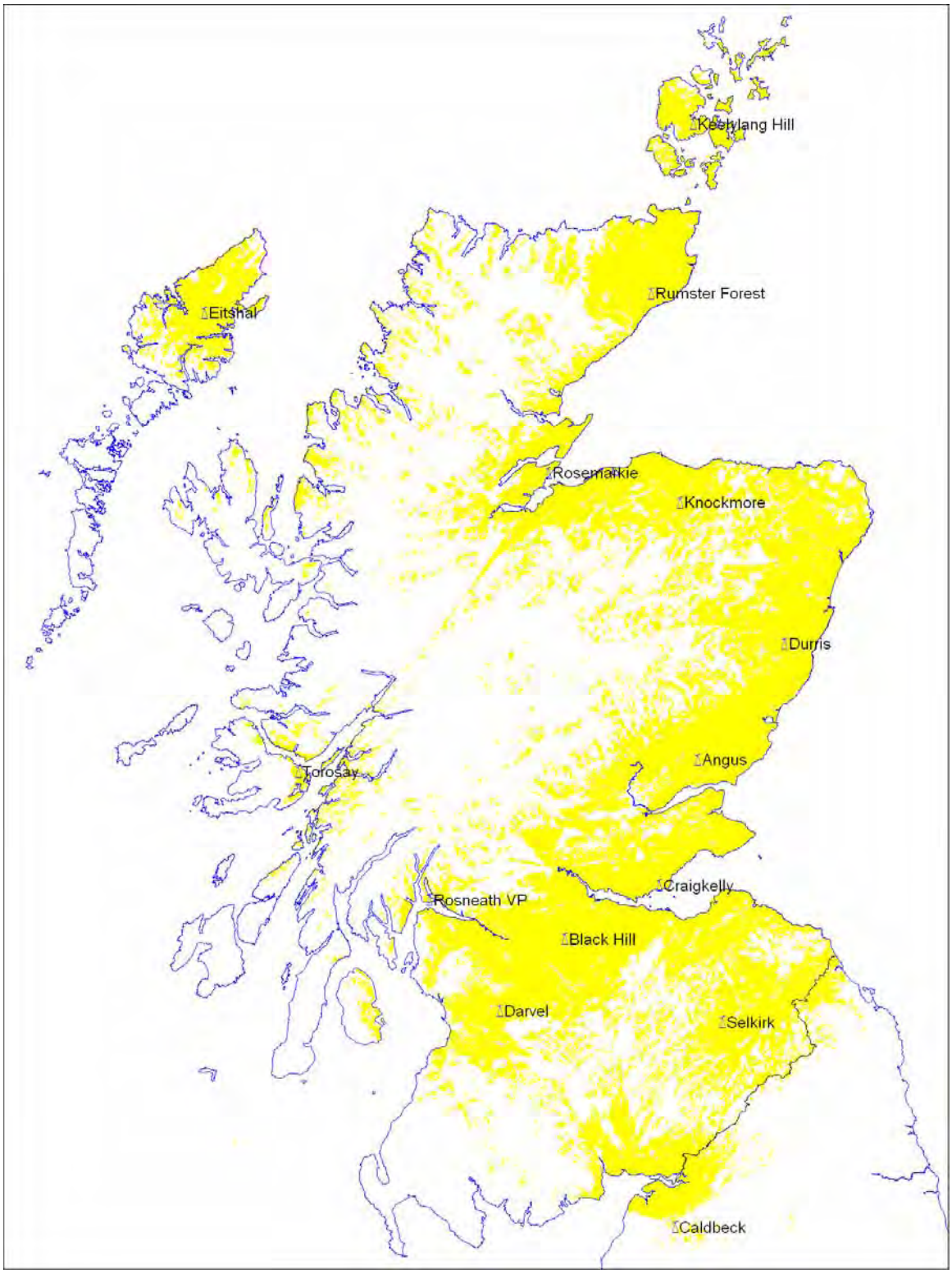


Figure 6: Coverage of the 1st Scottish Layer

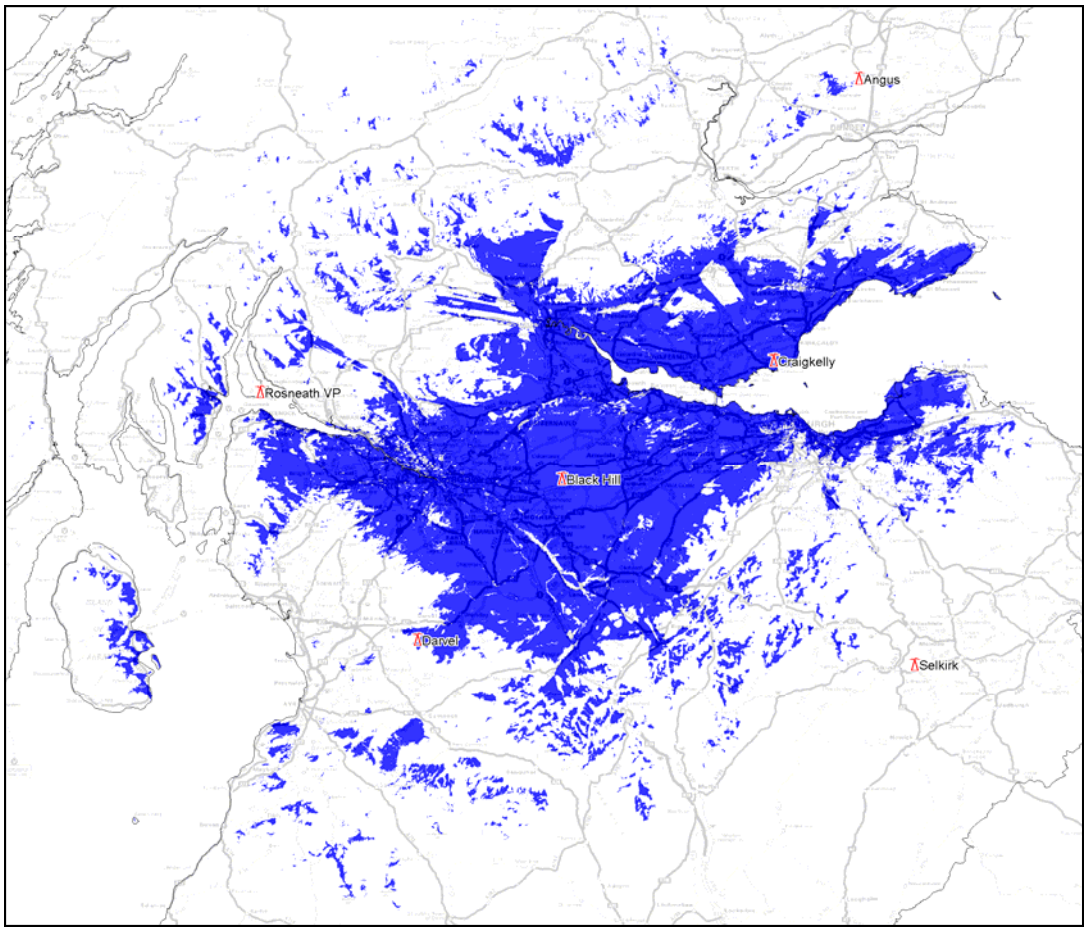


Figure 7: Coverage of the 2nd Scottish Layer

		1st Layer	7_core	2nd Layer	8_core
13402	Bressay	4,978	4,623	-	-
10510	Torosay	4,452	4,439	-	-
15400	Eitshal	8,212	8,188	-	-
13400	Keelylang Hill	13,576	13,462	-	-
16100	Selkirk	29,753	29,705	-	-
14800	Rumster Forest	44,948	43,195	-	-
15300	Knockmore	46,517	40,791	-	-
15600	Rosemarkie	67,327	67,233	-	-
15211	Rosneath VP	90,479	89,769	-	-
15200	Darvel	99,818	94,849	-	-
11200	Durris	212,934	194,202	-	-
16500	Caldbeck (Scotland)	67,149	67,102	-	-
12300	Angus	308,866	278,746	-	-
14700	Craigkelly	511,735	495,483	391,959	364,128
10500	Black Hill	1,092,708	1,089,765	1,057,962	1,054,364

Table 8: Gross coverage of Scottish Layers 1 and 2

	Gross	Core
1st Layer	2,014,698	1,921,617
	Gross	Core
1st Layer	2,011,475	1,918,211
2nd Layer	1,244,629	1,237,811

Table 9: Coverage of Scotland Layers 1 and 2

7 DISCUSSION

7.1 Coverage

The fourteen sites using a 64QAM 2/3 modulation scheme have the potential of reaching about 84% of the Scottish population[2].

Operating from just two sites, Black Hill and Craigkelly, approximately 52% of the Scottish population could be served.

The five clear channels offer the potential for many different options for providing additional coverage in Scotland, more layers, more robust coverage, the use of SFN etc.

7.2 Impact to UK networks

Though planning has not been based on the interleaved planning rules, there is minimal impact to the UK v5.61 plan 3PSB or 6Core coverage. To minimise impact on core coverage, where possible, channels at stations have been selected on the basis of existing relationships. Examples of this are.

Caldbeck Scotland uses channels 24 and 27, the third channel, channel 21, in this standard group is unused. Using channel 21 out of the same antenna as channel 24 and 27 will impact the coverage of any multiplex using channel 21. In the case of Caldbeck it interacts with Divis and Craigkelly. As both stations are affected by the main multiplexes on channels 24 and 27 the use of channel 21 at Caldbeck causes no material damage to Core coverage and goes someway towards equalising coverage.

Darvel PSB and COM multiplexes are co-channel with Caldbeck multiplexes other than channel 30. Use of channel 30 at Darvel at 200Watts has no effect on Caldbeck Core coverage.

Durris PSB multiplexes are co-channel with Belmont PSB multiplexes. The use of channel 30 at Durris for an additional service would introduce a relationship with Belmont COM4 on

[2] Scottish population is taken as 2,396,379 households.

channel 30. However, because of the existing relationships between the stations Durris channel 30 has little on Belmont.

7.3 Impact to the Continent and Ireland

Sites in Scotland have the potential to exceed 23dBµV/m at the Norwegian and Irish coast. Particularly the Irish coast in Donegal between the Inishowen Peninsula and Malin Head, Figure 8. International restrictions required at each site to limit interference to 23 dBµV/m are shown in Figures 9a, 9b, 9c and 9d.

Figure 8: Area of Ireland subject to interference from Scottish stations.

Black Hill

To protect the Irish coast at Donnegal a restriction of 12dB relative to 10kW is required at Black Hill. Using the main DTT antenna, which provides about 2dB protection in the VRP and HRP and operating at 5kW ERP, Black Hill will put down up to 30dBµV/m on the Irish coast. Where as this exceeds the ITU trigger threshold it is not expected to cause Ireland problems.

Darvel

At 1kW ERP Darvel requires a restriction of 10dB towards Donnegal. The main DTT antenna provides about 3dB protection which limits Darvel to 200 Watts. The main population centre served by Darvel is Ayr which lies on a line between Darvel and Donnegal.

Rosneath

At 1kW ERP Rosneath requires 11dB restriction to protect Ireland. Using the main DTT antenna, which provides about 2dB protection, it would be possible to operate Rosneath at an ERP of 125 Watts.

Torosay

At 1kW ERP Torosay requires a 22dB restriction to protect Ireland. The main DTT antenna pattern offers about 9dB of protection which limits Torosay to 50 Watts ERP.

Eitshal

At 1kW Eitshal requires a 5dB restriction towards Ireland. The main DTT antenna at Eitshal provides about 2dB protection, which limits the ERP to 500 Watts.

Craigkelly

At 10kW ERP Craigkelly requires a 2dB restriction towards Ireland and a 2dB restriction towards Norway. Both these restrictions can be accommodated by the antenna pattern of the main DTT antenna.

Durris

At 10kW ERP Durris requires 5dB restriction towards Norway. As the main DTT antenna provides about 3dB protection operating Durris at 10kW would exceed the ITU trigger threshold by about 2dB.

Angus

Operating at up to 10kW no restrictions are required at Angus.

Bressay

At 1kW Bressay requires a 16dB restriction to protect Norway. The main DTT antenna will provide about 9dB protection which limits the ERP at Bressay to 250 Watts.

Keeylylang Hill

At 10kW Keelylang Hill requires up to 10dB restriction towards Norway. The main DTT antenna offers about 3dB in the HRP and 3dB in the VRP limiting the maximum ERP to 4kW.

Knockmore

Operating at up to 10kW no restrictions are required at Knockmore.

Rumster Forest

At 10kW ERP Rumster Forest requires a 6dB restriction towards Norway. The main DTT antenna provides about 3dB protection at ch30 and 4dB protection at ch55.

The proposal of swapping channel 30 with channel 55 would require Norway allowing Rumster Forest at an ERP of 20kW to put a field strength down on its coast of about 28 dBµV/m, a level 5dB above the ITU trigger threshold.

Caldbeck

At 10kW Caldbeck requires a 22dB restriction to protect the east coast of Ireland in the area immediately adjacent to Northern Ireland. The main Caldbeck Scotland antenna used by main multiplexes PSB2 and PSB3 provides about 12dB of protection to this area. Use of this antenna limits the ERP to 1kW.

Selkirk

Operating at up to 10kW no restrictions are required at Selkirk.

Rosemarkie

At 10kW ERP Rosemarkie requires a 9dB restriction to protect Norway. As the main DTT antenna provides about 3dB protection in the VRP the ERP is limited to 2.5kW.

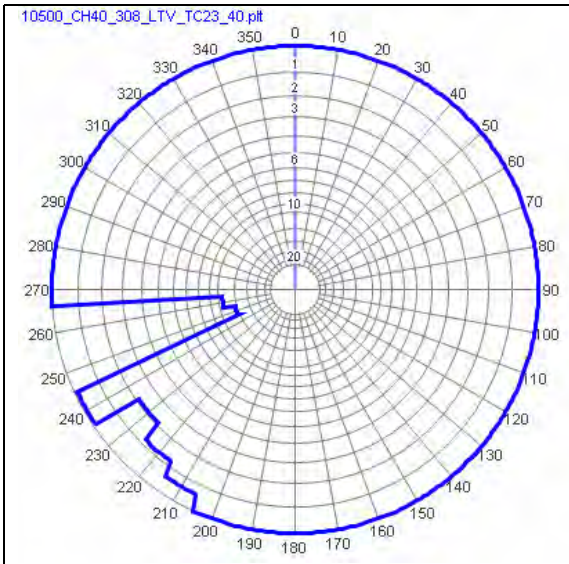
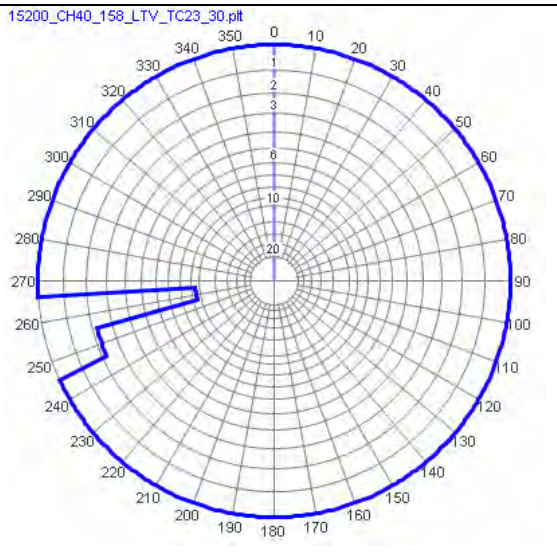
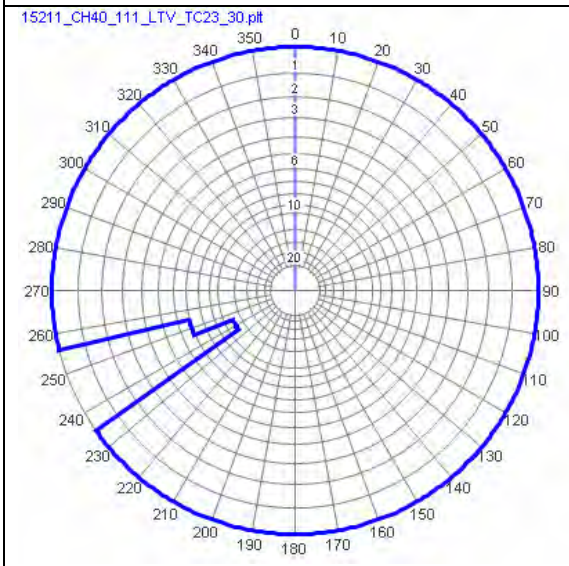
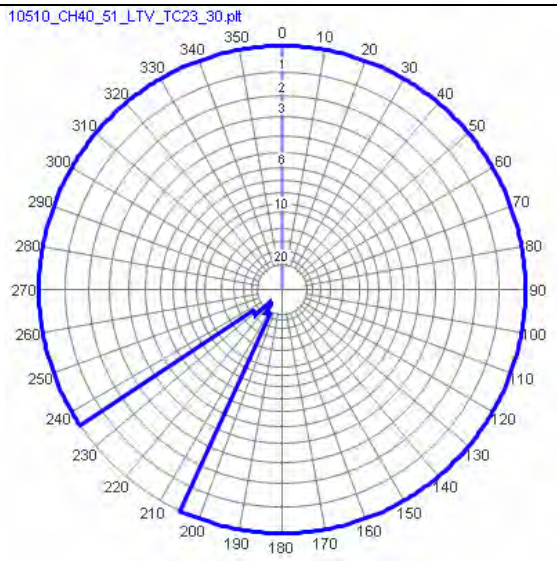
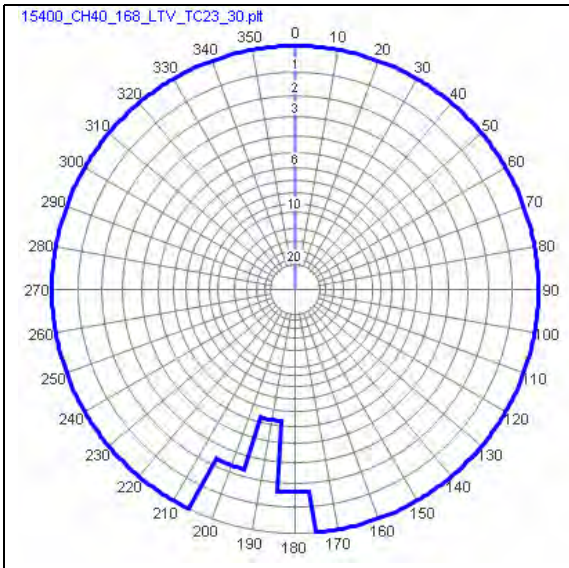
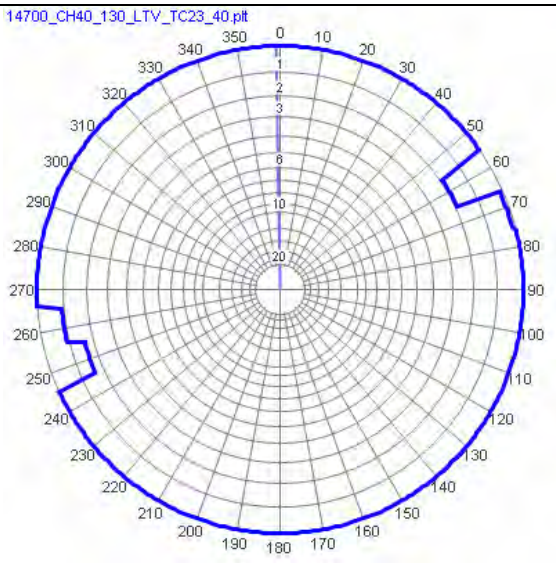
	
10500 Black Hill @ 10kW ERP 308m a.g.l	15200 Darvel @ 1kW ERP 158m a.g.l.
	
15202 Rosneath @ 1kW ERP 111m a.g.l	10510 Torosay @ 1kW ERP 51m a.g.l.

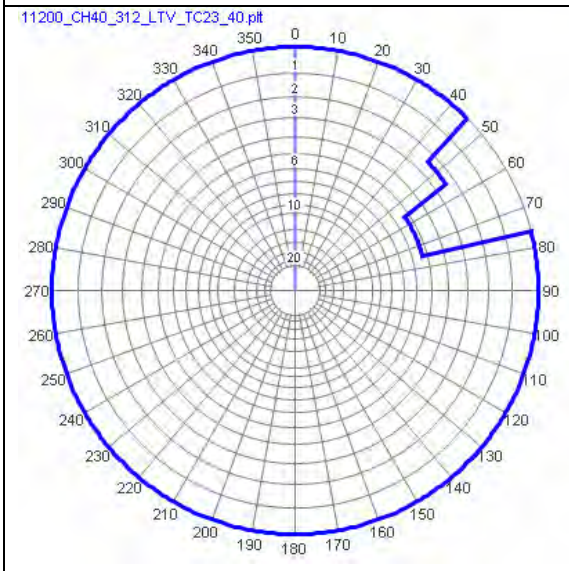
Figure 9a : International restrictions based on limiting interference to 23dBµV/m



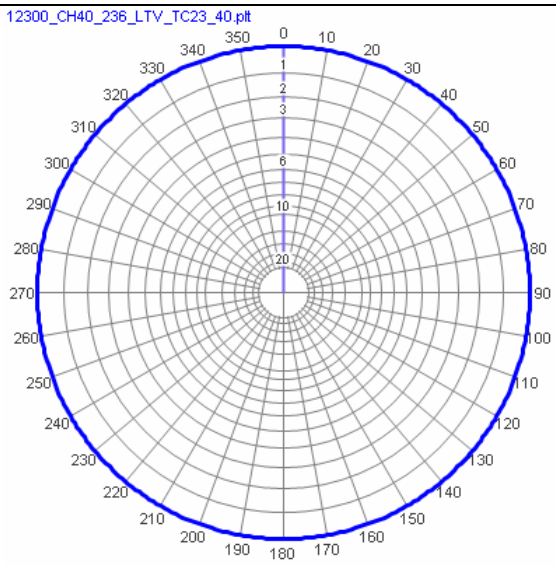
15400 Eitshal @ 1kW 168m a.g.l.



14700 Craigkelly @ 10kW 130m a.g.l.



11200 Durris @ 10kW ERP 312m a.g.l.



12300 Angus @ 10kW ERP 236m a.g.l.

Figure 9b : International restrictions based on limiting interference to 23dBµV/m

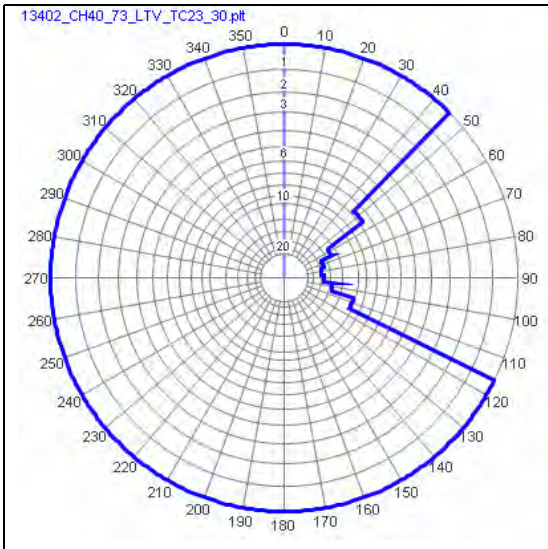
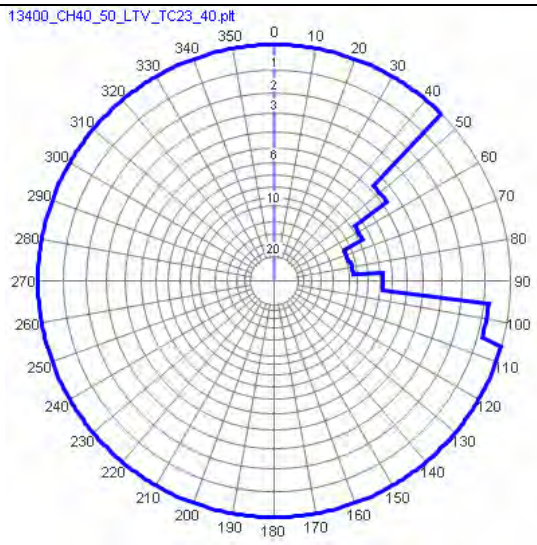
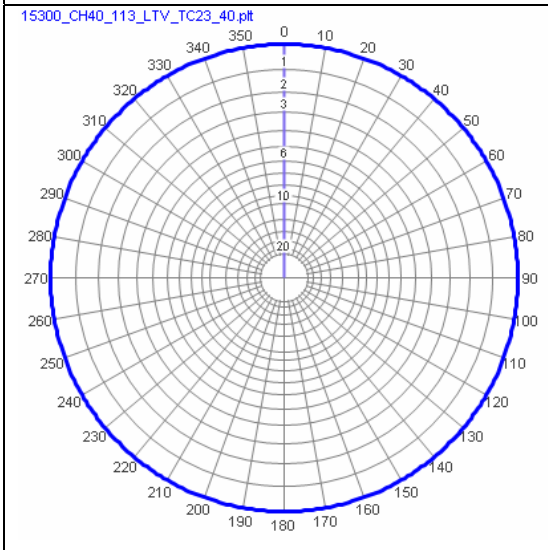
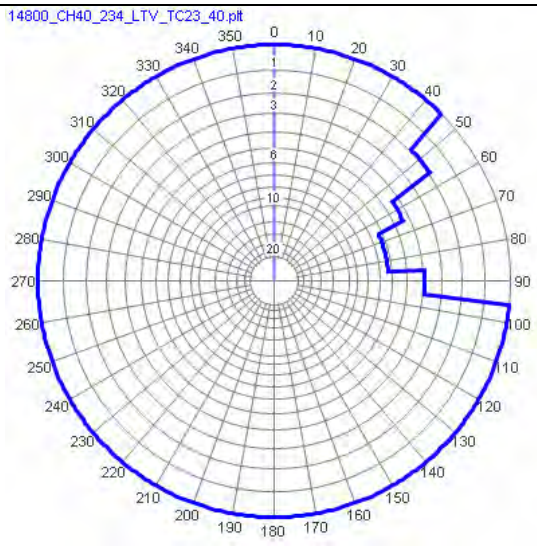
	
13402 Bressay @ 1kW 73m a.g.l.	13400 Keelylang Hill @ 10kW 50m a.g.l.
	
15300 Knockmore @10kW 113m a.g.l.	Rumster Forest @ 10kW 234m a.g.l.

Figure 9c : International restrictions based on limiting interference to 23dBµV/m

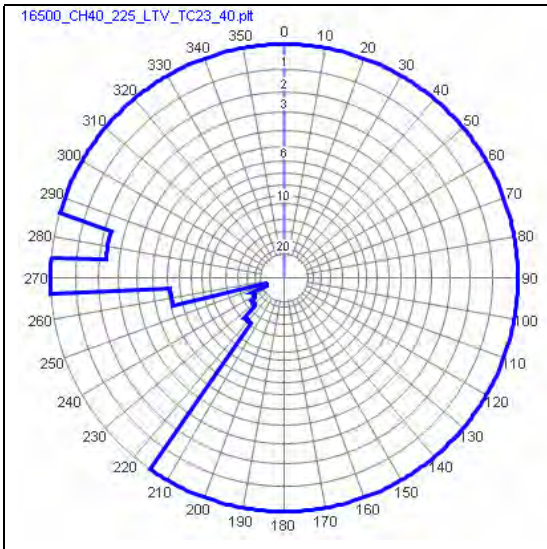
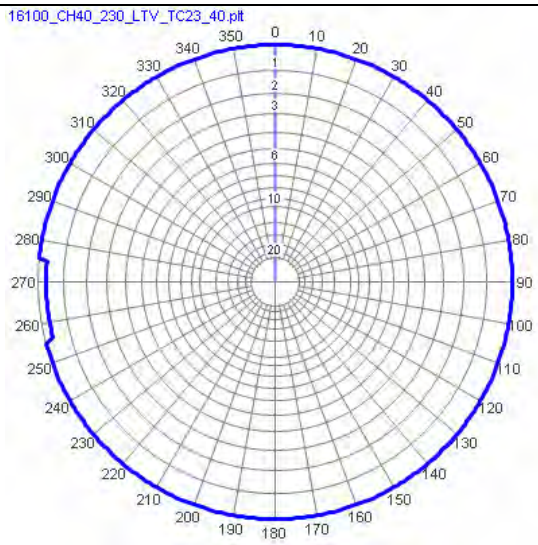
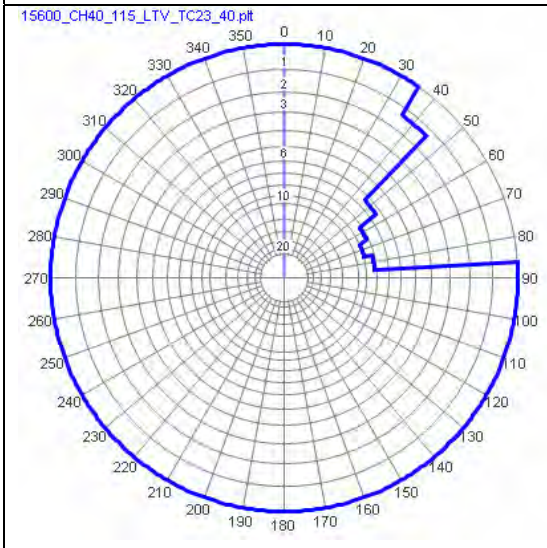
	
16500 Caldbeck @ 10kW ERP 255m a.g.l.	16100 Selkirk @ 10kW ERP 230m a.g.l.
	
15600 Knockmoor @ 10kW 115 m a.g.l.	

Figure 9d : International restrictions based on limiting interference to 23dBµV/m

8 CONCLUSION

Alternative channels have been found for the ten stations that need to be re-channelled to allow channels 30, 48, 51, 52 and 56 to be released. The alternative channels provide nominally equivalent coverage to those released in the areas the stations are required to serve.

The proposed changes will require agreement from Norway to the use of channel 55 at Rumster Forest. This is not anticipated to be a problem as depending on the ERP co-ordinated the field strength on the Norwegian coast exceeds a 23 dBμV/m trigger threshold by between 2dB and 5dB.

The released channels can be used at the fourteen primary DTT stations across Scotland with some restrictions. In all cases, apart from Black Hill, viable services can be provided using the main DTT antenna and limiting the ERP where necessary to not exceed 23 dBμV/m on the Irish or Continental coastlines. At Black Hill, in order to provide a service across Glasgow field strength levels to coastline in Donegal, Ireland will be of the order of 29 dBμV/m.

Based on the parameters used in the study, the released channels offer potential coverage of an additional layer to about 84% of Scottish households. Additionally a second layer covering the Glasgow/Edinburgh corridor could be implemented that provides coverage to 52% of Scottish population.

The study only considered two scenarios – the released spectrum approximately equivalent to that available to a main commercial multiplex could be used in many different ways.

9 APPENDIX 1: PROPOSAL

9.1 Introduction

Further to the studies that NGW has recently carried out for Ofcom regarding Local DTT NGW would like to make a proposal to Ofcom to review Spectrum efficiency in Scotland.

From work carried out by NGW for the JPP and the Local DTT studies it is thought that there may be potential to release some additional spectrum in Scotland by more efficiently grouping the existing channels. The aim of the study would therefore be to determine the possibility of enabling a 7th multiplex in Scotland.

9.2 Scope

Because Scotland is geographically remote from Ireland and the Continent and Scottish stations have little interaction with UK sites in England and Northern Ireland there is potentially more spare spectrum capacity in Scotland than elsewhere in the UK. Initial investigation of the use of standard channel groups across Scotland has shown that the inefficient use of a number of channels, typically at small relay sites, limits their use at main stations for other DTT services. It is proposed that with a small amount of re-planning all stations carrying the main multiplexes in Scotland could be put on standard groups thereby clearing a number of channels for use by, for example, a 7th Scottish multiplex.

The implementation of any proposal resulting from this study would require changes to the DSO rollout plan and may incur some inconvenience to the broadcasters and the network builders as a result of any proposed changes. To minimise this inconvenience and avoid costly equipment changes, as Scotland is due to switch in mid to late 2010 changes need to be flagged sooner rather than later. Though there is potential disruption to the DSO plan the benefits derived from the more efficient allocation of spectrum are believed to be of significant value to Ofcom.

Objective	To determine the viability for more efficiently allocating spectrum in Scotland with the potential for possibly releasing channels in Scotland.

Methodology	• New channels will be identified for the stations which would need to be changed to accommodate the more efficient spectrum use.
	• Nominal channel allocation to the main stations in Scotland for two scenarios will be determined, namely:
	  • A single national coverage.
	  • A single national coverage + a second coverage in the Glasgow/Edinburgh corridor.
	• Coverage prediction runs will be carried out for the affected stations and a comparison made between their existing figure of merit and that achieved using v5.61 of the plan.

Deliverable	• A report detailing the viability of more efficiently allocating spectrum in Scotland. This will include: • A brief note for each station summarising the changes and any impact on coverage. • Coverage maps and coverage figures for the two scenarios noted above, together with an impact assessment in respect to the modified UK national plan v5.61.
Information	NGW will make use of proprietary software as part of this study which will remain the property of NGW.