

REPORT

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DATE: March 2013

101092233MKS-001b

Research Study of Energy Consumption of Digital Radios

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SUMMARY

This report contains the results of power consumption measurements on a range of digital radios and is an update to previous reports on this subject carried out in 2010 and 2011.

- Test data has been provided for 78 different models, 38 from testing carried out since the previous reports and 40 from current tests.

Table 1 below provides an overall summary of the in-use and standby power consumption figures for all 78 models and a comparison with the previous two projects (carried out in 2010 and 2011).

Mode	Average all products (W)		
	101092233	R66398	R66198 & R66398 combined
	(2013 test)	(2011 test)	(2010 and 2011 tests)
Total number of products	78	57	221
Power consumption in-use DAB	3.75	4.05	6.11
Power consumption in-use FM (in DAB)	5.38	4.68	8.99
Power consumption in-use FM only	4.69	6.04	6.01
Power consumption internet	4.98	10.55	14.05
Standby power consumption	0.84	1.02	1.86

Table 2 provides an overall summary of the in-use and standby power consumption figures by product category.

Table 2 - Summary of results by product (2013 test)

	Average in use power consumption (W) (2013 test)	% difference against FM only	Average standby consumption (W) [1] (2013 test)	% difference against FM only
Tabletop (29 products tested)				
DAB	3.34	-39%	1.17	-49%
FM (in DAB)	3.68	-34%		
FM only	5.40		3.37	
Internet (in DAB)	4.57		NA	
Internet (no DAB)	6.40		1.25	
Tabletops/portables (35 products tested)				
DAB	2.04	NA	0.58	NA
FM (in DAB)	2.38			
FM only	NA	NA	NA	
Internet (in DAB)	NA		NA	
Internet (no DAB)	3.43		0.90	
Mini/Micro/audio (14 products tested)				
DAB	10.48	152%	0.53	-24%
FM (in DAB)	10.69	157%		
FM only	4.16		0.70	
Internet (in DAB)	7.49		0.53	
Internet (no DAB)	NA		NA	

Notes: [1] Greater than 1W is allowed if device has a clock
NA - not applicable

For comparison **Table 3** provides an overall summary of the in-use and standby power consumption figures by product category (combined 2010 and 2011 tests).

Table 3 – Summary of results by product (combined 2010 and 2011 tests)

	Average in use power consumption (W) (combined 2010 and 2011 tests)	% difference against FM only	Average standby power consumption (W) (combined 2010 and 2011 tests)	% difference against FM only
Tabletop (78 products tested)				
DAB	4.78	0%	1.56	-7%
FM (in DAB)	3.35	-30%		
FM only	4.78		1.68	
Tabletop/portables (96 products tested)				
DAB	3.14	166%	0.81	0%
FM (in DAB)	2.57	118%		
FM only	1.18		0.81	
Mini/Micro/audio (38 products tested)				
DAB	9.01	19%	0.60	-37%
FM (in DAB)	9.12	21%		
FM only	7.54		0.95	

Table 4 provides an overall summary of the in-use and standby power consumption for tradebrands versus non-tradebrands (2013 test).

Table 4 - Tradebrands v Non-tradebrands

	Tradebrands (2013 test)	Non-tradebrands (2013 test)
No. of models tested	24	54
Power consumption in-use DAB (W)	2.37	4.40
Power consumption in-use FM (in DAB) (W)	2.99	6.32
Power consumption in-use FM only (W)	5.61	4.32
Power consumption in-use Internet (in DAB) (W)	NA	5.54
Power consumption in-use Internet (no DAB) (W)	NA	4.42
Standby power consumption (W)	0.62	0.95

Introduction

Intertek Milton Keynes was commissioned by DCMS, to update the research and testing data from 2010/2011 (see reports below) and update the energy consumption model developed for digital radios. Previous reports on this were:

R66198 Research Study of Energy Consumption of Digital Radios Upgrade – Phase 1 Issue 1 (2010)

R66398 Research Study of Energy Consumption of Digital Radios Upgrade Issue 3 (2011)

The project was split into 3 Phases:

- Phase 1
Market analysis and purchase of samples for testing
- Phase 2
Power consumption measurements of samples purchased
- Phase 3
Update to the digital radio model produced to forecast changes to energy consumption post switchover

This report covers the results from Phases 1 and 2 only; an updated model will be supplied separately.

Testing was carried out at Intertek Milton Keynes during March 2013. This report should be read in conjunction with Excel spreadsheet **101092233MKS-002a.xls**.

The tests have been carried out in accordance with the test programme, and as such, the results are only applicable to the sample tested and the conditions of the test. Sample variability and changes in test conditions could influence some results, and the result(s) as stated may not be representative of the mean result if a number of different samples were tested under a variety of test conditions.

Taken on its own, this report should not be used for regulatory purposes e.g. declaring conformance with directives.

1 Existing Data

Power consumption data for a range of products launched since the previous projects, belonging to another Intertek client, was made available to this project, after obtaining consent from the client. These products were incorporated into the main database of available products and, from this list, 40 new models were selected for testing.

2 Market Analysis

Market analysis was carried out to ensure that the products chosen for testing represented the market both in terms of brand coverage and specific models of radio.

A thorough search of radio manufacturers, major online retailers and price comparison websites was undertaken to identify the most common brands and models currently on the market. Models launched since the previous testing in 2011 were specifically targeted.

From these sources a list of currently available products was compiled, **Appendix I**. All products were organised into brands and categories to enable short listing of products. The list of available products was compared with results that were available from previous testing and care was taken to avoid testing duplicate or similar models. We also ensured that there was good coverage of trade brands and non-trade brands as well as a range of price points.

The selection of models to test was based on a number of factors:

- Good representation of the major DAB brands (as per GfK data). Multiple samples were chosen from the brands with the highest market share and product ranges.
- Coverage of the majority of brands in the market, including some new brands to the market since the last test was carried out in 2011. Data is available for 31 different brands.
- Good representation of the various trade brands, given their high percentage share of the portable audio market.
- Good coverage of the different types of radio receiver, eg portable/tabletop, clock radios, CD players, iPod docks etc. Since tests in 2011, there has been a significant increase in radios that incorporate iPod docks and music streaming facilities and this has been taken into account.
- Where a manufacturer had a range of models available, preference was given to the newest and most popular/widely available models. Care was taken to avoid similar models.
- Where available, FM only models were included for comparison.

3 Purchase of Samples

The samples selected for testing were purchased through normal consumer channels, either via the internet or from high street retailers.

4 Product Categories

The radios selected for testing were categorised into the following groups:

Tabletop: Unit has integrated loudspeakers and mains powered only, **Figures 1 and 2.**



Figure 1 – Tabletop (small)



Figure 2 – Tabletop (large)

Tabletop/Portable: Unit has integrated loudspeakers and can be mains or battery powered. It is small/light enough to carry when battery powered and may have a carrying handle, recess or groove, **Figure 3.**



Figure 3 – Tabletop/Portable

Mini/Micro/Audio: The unit has separate loudspeakers and is likely to be a multi-function device probably incorporating a CD player or iPod docking mechanism, **Figure 4**. It is also mains powered only.



Figure 4 – Mini/Micro System

5 Power Consumption Measurements

Standby and off-mode measurements have been measured according to BS EN 50564: 2011. Where power saving features were available (e.g. dimming of displays, clock display on/off etc) measurements have been made at the minimum and maximum settings for standby mode and for 'on-modes'. Two figures are entered in the results table for standby power and for on-mode power if the display brightness is adjustable. This shows that in some cases the measured value can be significantly higher than the allowed standby power consumption according to the EU directive. In practice we question whether consumers would implement the lowest power standby modes. The reason for the higher power modes can be either full brightness of the clock display or keeping an internet or network connection active.

For the on-mode measurements, a pink noise based simulated programme test signal was used as the input to the radios via a DAB or FM generator, the volume was then adjusted to achieve a sound pressure level of 70dBA measured in our standard ¹ listening room. The measurement was recorded at 0.5 metre, 1 metre or 3 metres depending on the type of unit. For small radios and clock radios the distance used was 0.5 metres. For tabletop radios the sound level was measured at a distance of 1 metre. For mini Hi-Fi units and larger amplifiers the distance used was 3 metres.

In the case of a system not supplied with speakers, 6 ohm dummy load resistors (typical nominal speaker impedance) would have been used instead of speakers and the volume of the unit would have been adjusted to obtain a reading of 1 watt across one of the resistors, measured with a true RMS voltmeter. However none of this type was tested in this batch.

To ensure the units under test were correctly warmed up and electronically stable, each unit was turned on and allowed to settle for at least 30 minutes. The units were tuned to a signal and had their clocks set to ensure they were not 'hunting' for signals. For standby measurements the samples were switched to standby after a minimum of 30 minutes in 'on-mode'. The samples were then left for at least 15 minutes in each standby before the power was tested and recorded when stability had been confirmed by the logging power meter. For 'on-mode' measurements the same 30 minute warm up period was employed before the readings were recorded for FM and/or DAB and/or Internet Radio modes.

5.1 Equipment Used

E10418 Kikusui Power Supply PCR1000

E10616 Yokogawa WT210 Power Meter

E10726 Yokogawa WT210 Power Meter

E10843 Airflow TA430 Anemometer

E10148 Vaisala HMI41 Humidity & Temperature Sensor

E10403 RS 206-3744 Thermometer

¹ IEC 60268-13

5.2 Conditions

All power consumption measurements were completed under controlled conditions. Throughout the testing procedure, the ambient temperature, relative humidity, airspeed and condition of the mains supply were monitored and controlled where necessary to ensure they complied with the requirements of BS EN 50564: 2011 and IEC 62087: 2008.

Voltage: 230v \pm 1% at 50Hz \pm 1%

Total Harmonic Distortion of voltage supply: < 0.2%

Temperature: 23°C \pm 5°

Relative Humidity: Between 10% and 80%

Airspeed: < 0.5m/s

5.3 Test Results

The power consumption test results are presented in Excel Spreadsheet **101092233MKS-002.xls**.

Appendix I



List of Products Tested

Sample code	Brand	Model name/number	Category	DAB	FM	Internet radio/Streaming
DR02	Bush	Bullet Black Digital Radio 9082249	Portable	Yes	Yes	No
DR03	Bush	CMC-CUBED-DAB	Micro	Yes	Yes	No
DR04	Bush	CMC1BT	Micro	No	Yes	No
WH10196-0045-00	Bush	Espresso DAB Radio DAB-042	Tabletop	Yes	Yes	No
WH10196-0071-01	Bush	935/3260 (SG002D)	Tabletop/Portable	Yes	Yes	No
DR08	Denon	RCD-M39DAB	Micro	Yes	Yes	No
DR09	Gear4	Airzone Series 1 PG539	Tabletop	No	Yes	No
DR10	Humax	BC-900i	Tabletop	Yes	Yes	Yes
DR11	John Lewis	Apollo 2	Tabletop/Portable	Yes	Yes	No
WH10196-0050-00	John Lewis	Carbon Stock No: 823 10104	Tabletop	Yes	Yes	No
WH10196-0072-01	John Lewis	Neptune Mono	Tabletop	Yes	Yes	No
DR12	Kitsound	Surfer	Tabletop	No	Yes	Yes
DR13	LG	CM2820DAB	Tabletop	Yes	Yes	No
DR06	Logik	LHFIP2112	Micro	No	Yes	No
DR05	Logik	L3DAB12	Portable	Yes	Yes	No
WH10196-0049-00	Logik	Wooden kitchen DAB radio with FM PLL L55DAB10	Tabletop/Portable	Yes	Yes	No
WH10196-0069-01	Logik	L6DAB11	Tabletop/Portable	Yes	Yes	No
WH10196-0080-01	M&S	Victoria DAB	Tabletop/Portable	Yes	Yes	No
WH10196-0070-01	Magicbox	Atom	Portable	Yes	Yes	No
DR14	Magicbox	STP0164MBX	Portable	Yes	Yes	No
WH10196-0068-01	Magicbox	White Cleaver (SG001D)	Tabletop	Yes	Yes	No
DR15	Onkyo	CR-555DAB	Micro	Yes	Yes	No
WH10196-0067-01	Onn	E80090R	Tabletop/Portable	Yes	Yes	No
WH10196-0078-01	Oxx	Classic + DAB	Tabletop	Yes	Yes	Yes
DR16	Panasonic	SC-HC27DB	Micro	Yes	Yes	No
WH10196-0075-01	Philips	AE5010/05	Portable	Yes	Yes	No
WH10196-0076-01	Philips	AE5430/10	Tabletop/Portable	Yes	Yes	No
WH10196-0066-01	Philips	AJB1002/05	Tabletop	Yes	Yes	No
DR17	Philips	BTM2056/05	Micro	No	Yes	No
DR18	Pioneer	X-EM21	Micro	No	Yes	No
DR19	Pioneer	X-CM31DAB-K	Micro	Yes	Yes	No
DR01	Polaroid	DS234I	Portable	Yes	Yes	No

Sample code	Brand	Model name/number	Category	DAB	FM	Internet radio/Streaming
WH10196-0054-00	Pure	Contour	Tabletop	Yes	Yes	No
WH10196-0061-01	Pure	Contour 100Di	Tabletop	Yes	Yes	No
WH10196-0082-01	Pure	Evoke Mio	Tabletop/Portable	Yes	Yes	No
WH10196-0064-01	Pure	One Classic Series II	Tabletop/Portable	Yes	Yes	No
WH10196-0053-00	Pure	One Elite	Tabletop	Yes	Yes	No
WH10196-0063-01	Pure	One Elite Series II	Tabletop	Yes	Yes	No
DR20	Pure	One Mi Series 2	Portable	Yes	Yes	No
WH10196-0065-01	Pure	One Mini Series II	Portable	Yes	Yes	No
DR21	Pure	Sensia 200D Connect	Tabletop	Yes	Yes	Yes
DR22	Pure	Siesta Mi Series 2	Tabletop	Yes	Yes	No
DR23	Pure	Sirocco 550	Micro	Yes	Yes	Yes
DR32	Red	NE-3126	Portable	Yes	Yes	No
WH10196-0040-00	Red	Wooden DAB Radio 583 151	Tabletop/Portable	Yes	Yes	No
WH10196-0062-01	Red	583 229	Tabletop/Portable	Yes	Yes	No
WH10196-0074-01	Revo	K2	Tabletop	Yes	Yes	Yes
DR24	Revo	Pixis iR	Tabletop/Portable	No	No	Yes
DR25	Roberts	Fusion	Tabletop	Yes	Yes	No
DR26	Roberts	MessageЯ	Portable	Yes	Yes	No
DR27	Roberts	Sound 38	Tabletop	Yes	Yes	No
DR28	Roberts	Sound 70	Micro	Yes	Yes	No
DR29	Roberts	Sound 200	Tabletop	Yes	Yes	No
WH10196-0038-00	Roberts	Classic DAB	Tabletop/Portable	Yes	Yes	No
WH10196-0059-01	Roberts	DreamDock	Tabletop	Yes	Yes	No
WH10196-0081-01	Roberts	Dreamtime 2	Tabletop	Yes	Yes	No
WH10196-0083-01	Roberts	Gemini (RD-45)	Tabletop/Portable	Yes	Yes	No
WH10196-0052-00	Roberts	Gemini 33 CRD-33	Tabletop	Yes	Yes	No
WH10196-0058-01	Roberts	Record R	Tabletop/Portable	Yes	Yes	No
WH10196-0055-00	Roberts	Sound 66	Tabletop	Yes	Yes	No
WH10196-0060-01	Roberts	Stream 105	Tabletop/Portable	No	No	Yes

WH10196-0057-01	Roberts	Vintage	Tabletop/Portable	Yes	Yes	No
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Sample code	Brand	Model name/number	Category	DAB	FM	Internet radio/Streaming
DR30	Roth	DBT-003	Tabletop	Yes	Yes	No
DR31	Sagemcom	HM40	Portable	Yes	Yes	No
DR33	Samsung	MM-E460D	Micro	Yes	Yes	No
DR07	Sandstrom	SDABTIP12	Micro	Yes	Yes	No
WH10196-0044-00	Sandstrom	SRDAB10	Tabletop/Portable	Yes	Yes	No
DR35	Sony	CMT-V75BTiP	Tabletop	Yes	Yes	No
DR34	Sony	HCD-G1BiP	Micro	Yes	Yes	No
WH10196-0039-00	Sony	XDR-S16DBP	Tabletop	Yes	Yes	No
WH10196-0073-01	Sony	XDR-S56DBP	Portable	Yes	Yes	No
DR36	Tangent	Uno	Tabletop	No	Yes	No
DR38	Technika	DAB129IDV	Tabletop	Yes	Yes	No
DR37	Technika	DR11202B	Portable	Yes	Yes	No
WH10196-0041-00	Tesco	DAB Clock Radio CR112DABV	Tabletop/Portable	Yes	Yes	No
WH10196-0056-01	Tesco	DAB 211E	Tabletop/Portable	Yes	Yes	No
DR39	Tivoli	PAL+	Tabletop/Portable	Yes	Yes	No
DR40	View quest	Retro DAB+	Portable	Yes	Yes	No

 New data from current models
 Data from other Intertek clients for current models