

***Digital Radio design challenges,
cost versus feature set
– what really matters?***

*Karen Parnell,
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EBU Digital Radio Summit, 16th February 2011*

- **Brief Introduction to Frontier Silicon**
- **The Rise of Digital Radio Sales – the influences**
- **Digital versus FM radios – what's inside?**
- **What do you want from your radio?**
- **Enabling Home Audio Products with Digital Radio**
- **Summary**

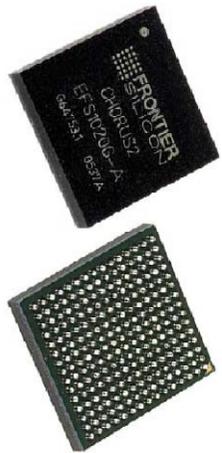


Providing the Technology to Drive the Market

Chips, modules, platforms

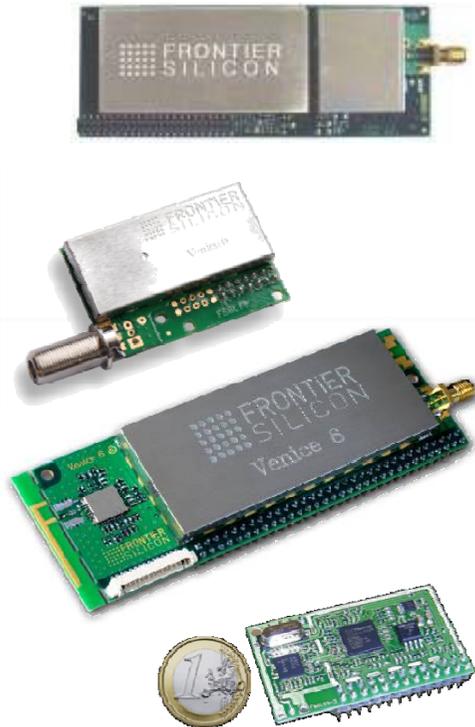


RF Baseband



Chipsets

DAB/DAB+/DMB-Radio FM/Wi-Fi/Ethernet



Modules

Kitchen/pocket Automotive...



Platforms

DAB/DAB+/DMB-Radio

FM-RDS

Audio CODECs

Slideshow

Clock Radio

Wi-Fi Radio

Streaming Audio

Premium Content

Field Upgrades

Industry Certification

Software

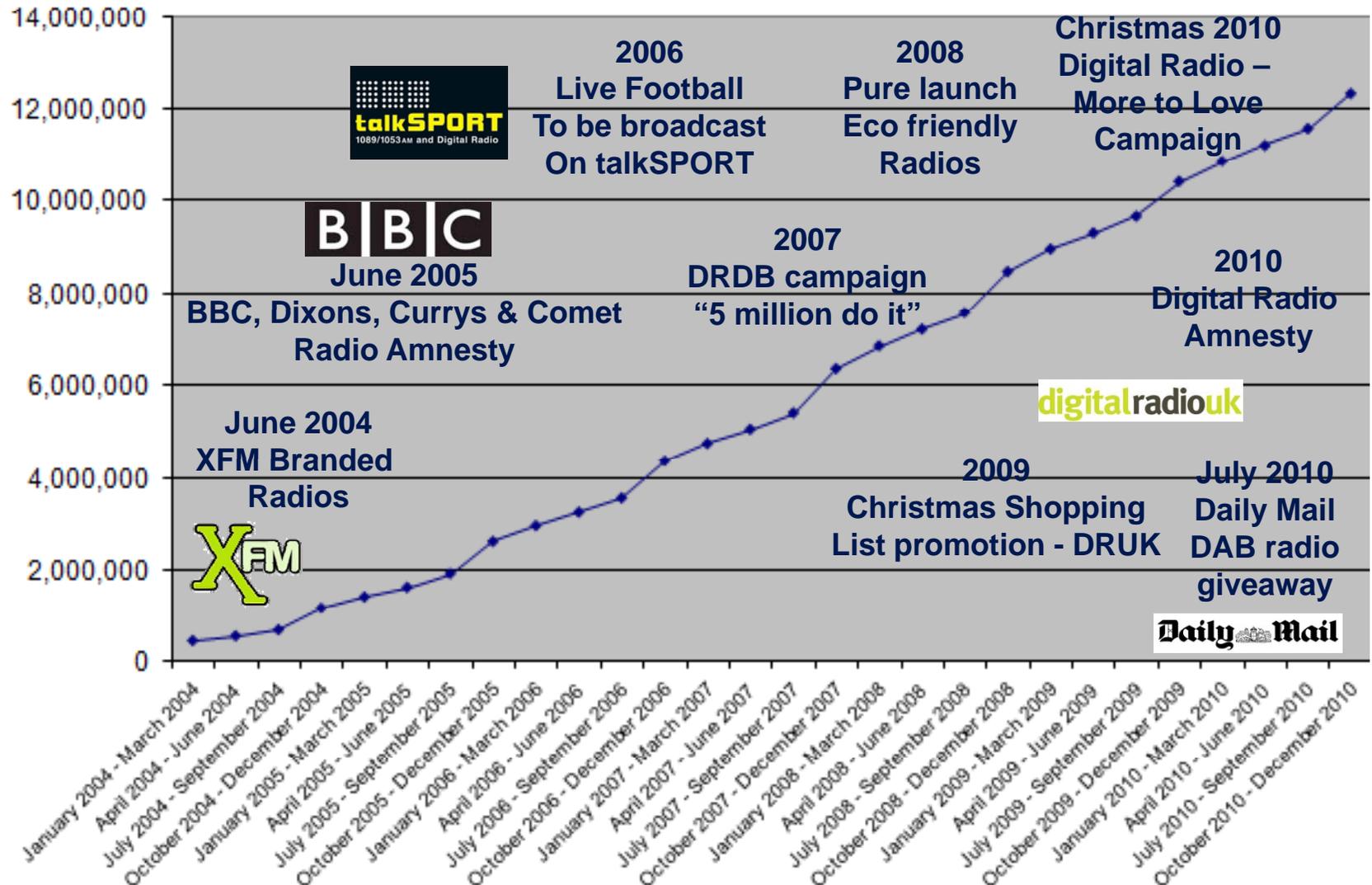
What Influences DAB Radio Sales?

Total DAB Sales Campaigns and Content

**UK Radio Amnesty
May – June 2010
6% Uplift in Sales**



**2003
Magic give away
An Evoke radio
Every week for
a year**



What Influences DAB Radio Sales?

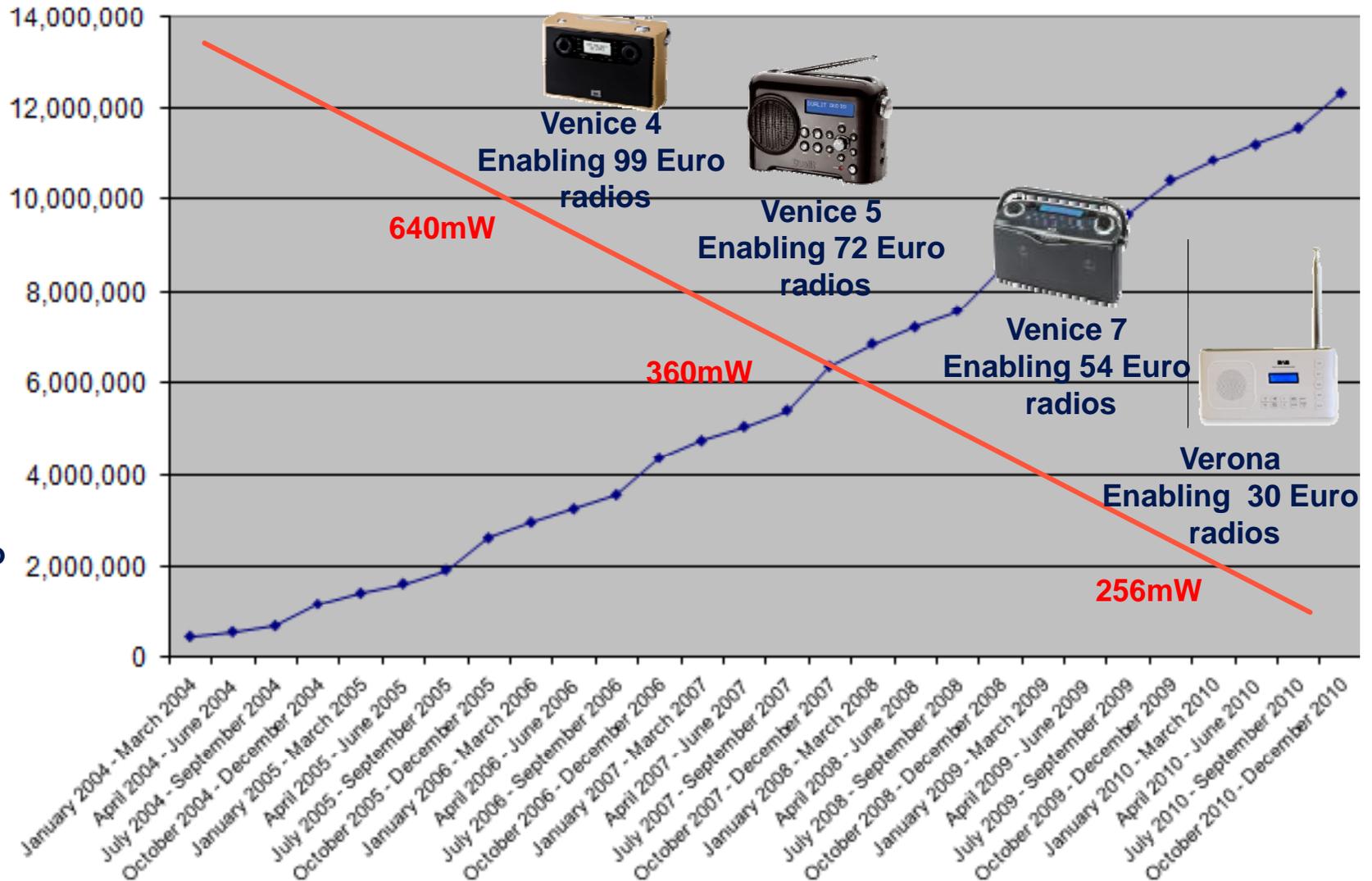


Arcam Alpha 10
£800
1999



Pure Evoke 1
First £99 DAB Radio
July 2002

Total DAB Sales Price and Power



What's in a Standard Analogue FM Radio?

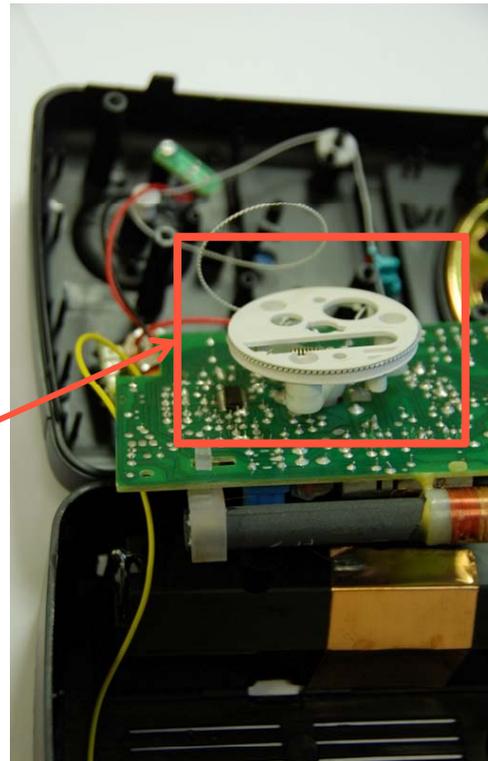
Not much!



**No display!
No buttons!**

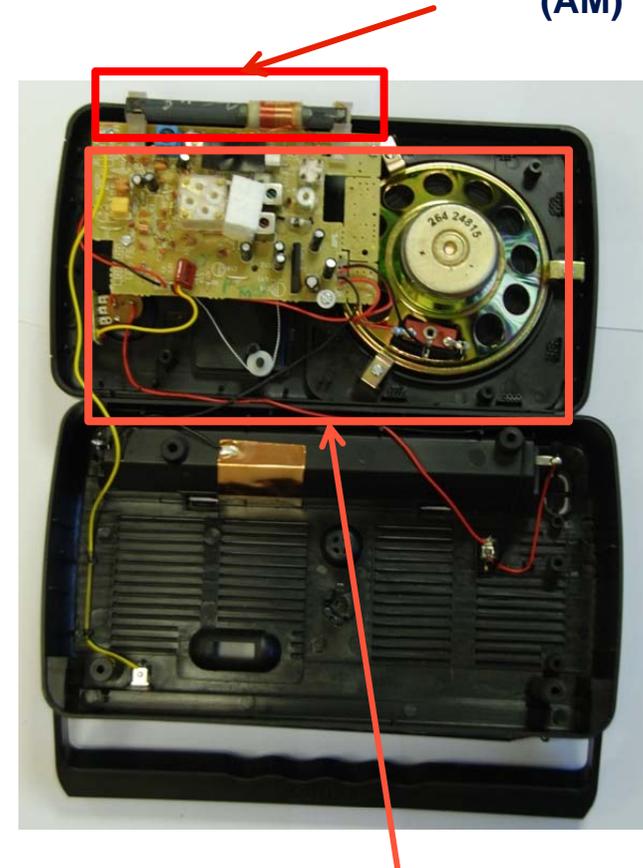
**Manual, mechanical
Tuning mechanism**

15 Euro



~ 20 Transistors

**Ferrite Rod Antenna
(AM)**



**Transformer, amplifier, speaker,
tuning variable capacitor
Plus other discrete components**

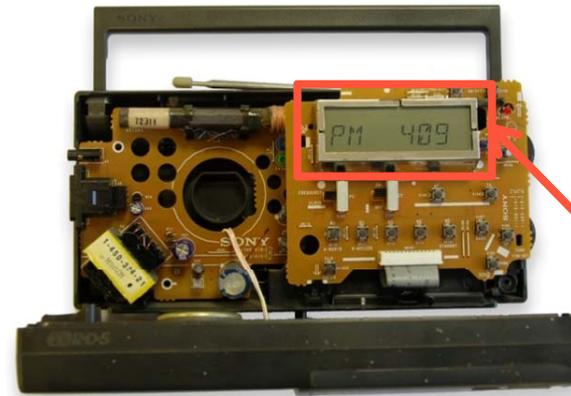
Apples with Apples? FM Radio with Display & RDS



ICF-M50 RDS
c1990

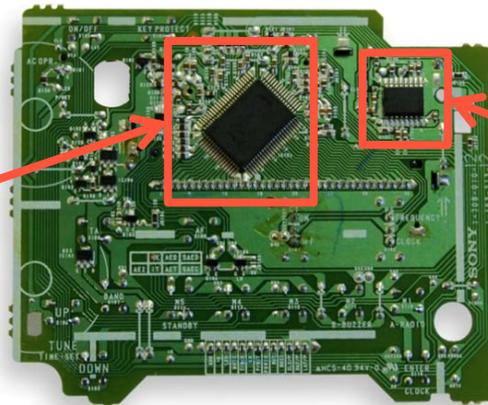


99 Euro!



LCD Display

AM, FM Receiver
Alarm
Traffic Announcements



NEC 8-bit Micro
Display controller
Button I/F

SAA6579T
RDS Demodulator

~ 20 – 30K Transistors

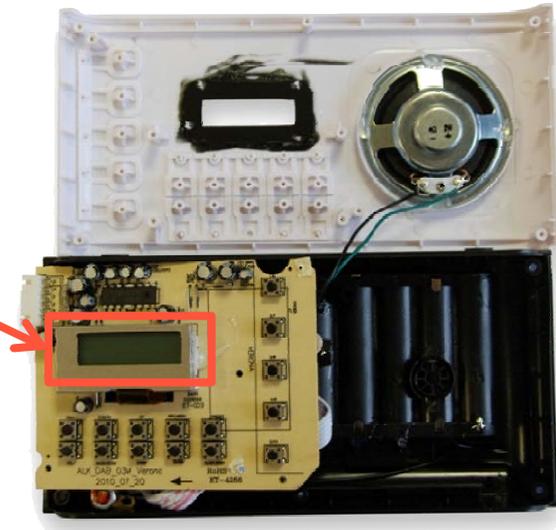
Low Cost DAB Radio



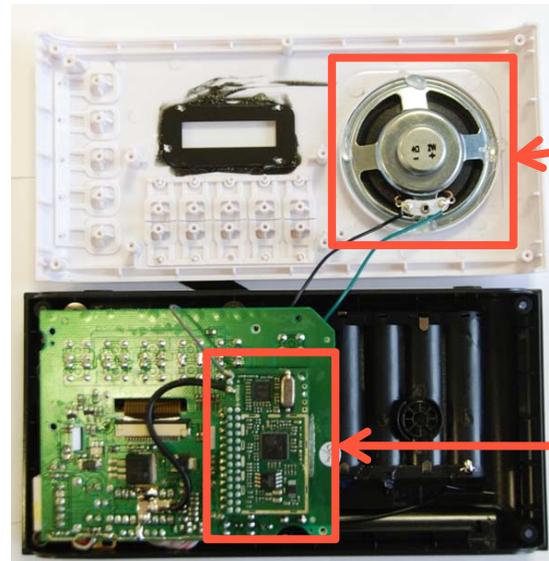
30 Euro



**2 x 16 DOT Matrix LCD
With back light
Display**



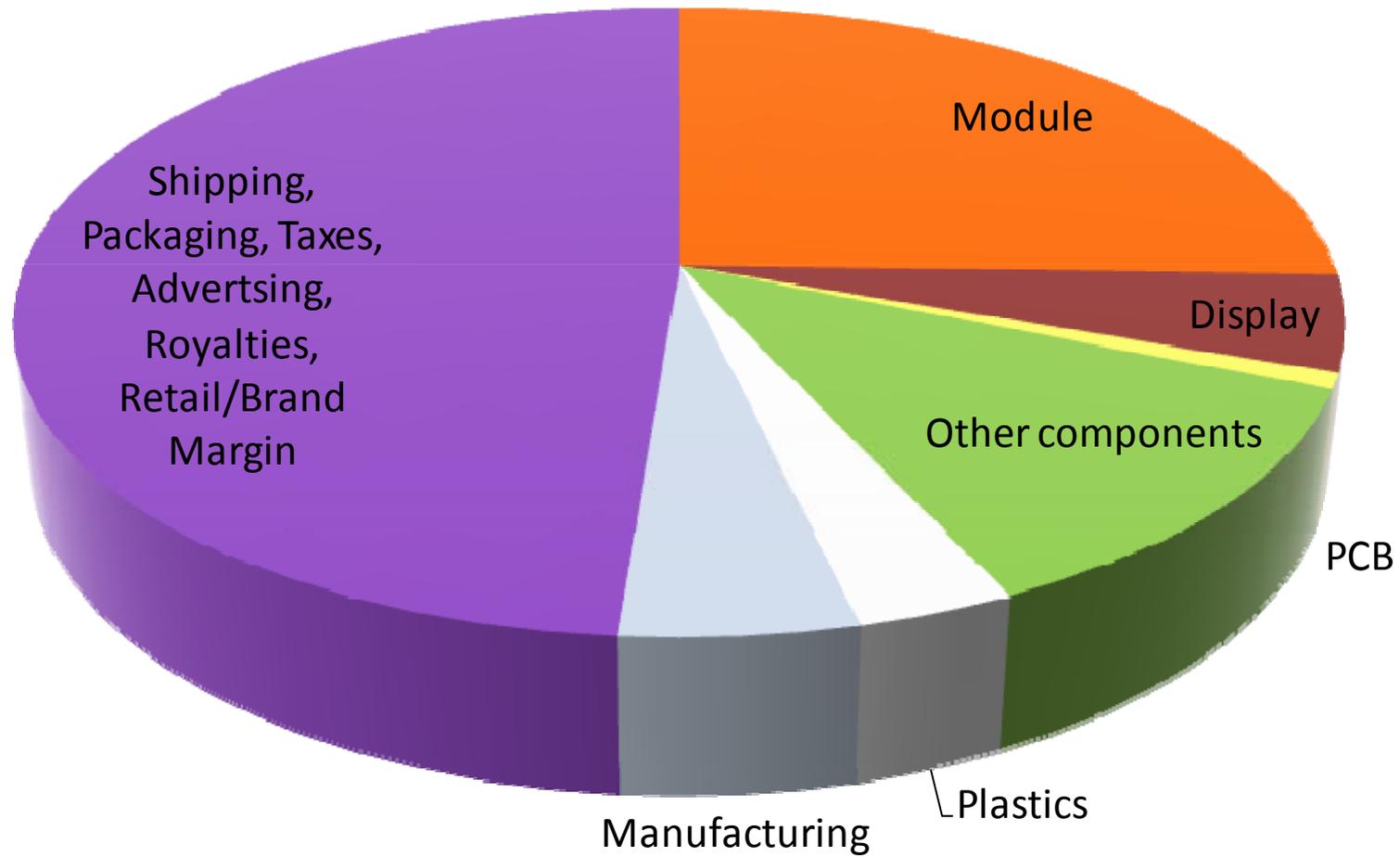
Single 1 W Speaker



**Verona Module
DAB, DAB+, DMB-R
FM -RDS
Display control
Button I/F
RF Front End
DAC
Alarm Clock**

~ 36 Million Transistors!

BOM Elements



Cost Versus Functionality



Feature	Lowest Cost (no display)	Modest Cost (Monochrome display & iPod Dock)	Must have Digital Radio Colour Screen – Cool!	iPod Nano Colour Screen
Price	16 - 24 €	60 – 100 €	120 €+	150 – 195 €
Digital Radio Reception				FM only
DLS – what's playing?				
Slideshow				
Album Art				
Weather Maps				
Local Travel Data				
EPG – what's coming on my favourite station?				
Text to Speech – tell me what's coming and what's on				
EQ – I like to choose what it sounds like!				
Tagging – let me listen or buy later				FM Only

We Need to be Careful What we wish for

- **Lowest cost radio's may not have a display or memory so will be equivalent in feature set and price to an FM radio**
 - With the same features set and low cost audio transducers, hence low end monaural audio
 - *BUT why buy a digital radio?*



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- **Why buy a digital radio?**
 - Visuals – I want to see the album art, I want to see whose in the studio via webcam, I want to see local weather maps and travel data, I want to see that product is advertised etc – needs a colour display!
 - I want to time shift my listening “Sky Plussing” – needs memory
 - I would like to know who is going to be on my favourite station and program – Electronic Program Guide (EPG) with record or alarm on the show
 - I want my radio to sound great! Stereo and HD Audio?
 - I want to tag or book mark a song or content to consume later
 - I want to listen to the extra channels and new, fresh content only available on Digital!

- **There is also a growing consumer demand for home audio products to feature digital radio**
- **The history of digital radio styles**
 - 2002/2003/2004 – Mainly kitchen style radios (Pure, Roberts, Alba) with also some high end tuners and CD Receivers (Shoe Box) and pocket radios
 - 2005/2006– Micro Hi-Fi starting to include digital radio, bigger brands (e.g. Sony) introducing digital tuners, also Digital radio adaptors for existing micro systems, some retailer own brands emerging
 - 2007/2008 – Explosion in digital radio enabled micro Hi-Fi systems and clock radios, EPP business starting and AVR integration
 - 2009/2010 – Start of iPod Docks with integrated digital radio, EPP business established (*15% of Dockers in the UK have digital radio*)
 - 2011 – Wider integration into micro Hi-Fi's, 1DIN aftermarket head units
 - 2012 – Integration into HTiB and Sound Bars, ubiquitous feature in European home audio

**Onkyo
"Shoe Box"
2005**



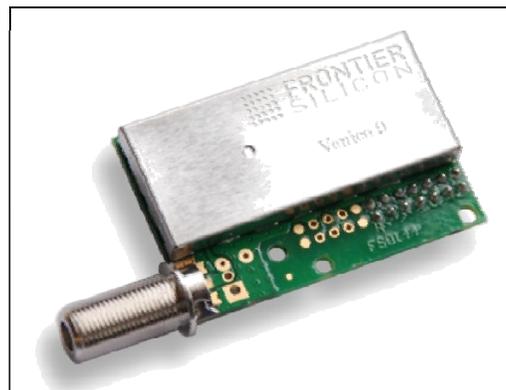
**Sony
Micro Hi-Fi
2007**



**John Lewis
EPP
2010**



- Home Theatre in Box (HTiB), micro/mini Hi-Fi systems, Sound Bars and iPod Docks tend to already have a microprocessor or microcontroller
- Adding digital radio needs to be quick, simple and low cost
- Slave mode only modules have started to be produced to address this need
- Up until now modules have been dual use: Master and Slave mode operation – this is not optimal for higher end home audio systems!
- **Slave mode modules:**
 - Optimised for slave mode only
 - I/O options and memory are reduced to reduce module size and cost
 - Controlled via the host processor using a simple Application Programming Interface (API)



- **Digital Radio prices are reducing – 70% in 4 years!**
- **The benefits of digital radio over analogue are innovative, compelling content and visuals based so we will do need products with Colour screens, more memory and cool user interfaces!**
- **Exciting rich content and time shifting needs cool looking colour screen products!**
- **Digital radio is happening in higher end Home audio products such as Dockers and HTiB using low cost slave mode only modules**



- Thank You -

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