



# A breakthrough innovation in Digital Broadcast Radio Receivers

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# The continuing value of broadcast radio

- Although invented more than 100 years ago radio broadcasting remains a highly important media
  - In parts of Africa more than 80% of people say they get their main news and information from radio, more than from any other media
  - In Latin America the total number of community stations is more than 10000, in Brazil alone there are said to be 10000 more waiting for licenses
  - Radio is the media we can consume whilst we actually do something else, drive, answer email, write PowerPoint slides, read a novel, relax in the sunshine!
  - In times of natural disaster Radio provides a vital service when infrastructure is compromised
  - Radio broadcasting and audio content is still an important part of the 'media mix'

# DRM the optimum radio broadcasting standard for now

- Digital Radio Mondiale (DRM) – Digital Radio for **all**
- Suitable for all broadcasting bands worldwide from low frequency (LF) to Very High Frequency (150kHz to 222MHz)
- High quality modern audio codecs to allow premium listening experience regardless of frequencies chosen
- Open standard to ensure a wide diversity of equipment, receivers and IP suppliers – open competition to give best consumer choice and value
- High capacity: more services, more content, more revenue in your available spectrum – The radio spectrum is a limited natural resource DRM uses that resource more cost effectively than analogue or digital competitors
- Wide diversity of content: stereo music, high quality speech, background data services for news, information, education (Journaline) still pictures and much more

# DRM the energy efficient broadcasting standard

We know DRM can use between 25% to 30% of the energy of analogue broadcasting – but what about compared to streaming?

Station scenario modelled	Approx <u>average</u> number of concurrent listeners	Approximate Power Consumption for Internet Streaming (Infrastructure + user devices)	Power Consumption using DRM Broadcasting (Transmitter infrastructure + receivers)	DRM vs Streaming
Nationwide News and Information Station covering area of UK	200,000	2900 kW	650kW (MF)	20%
Nationwide Music and Entertainment covering area of UK	1,000,000	14000 kW	900 kW (MF)	6.5%
Local FM broadcaster covering 625,000 people in 4,000 km <sup>2</sup>	6,000	164 kW	3.5 kW (VHF Band II)	4.5%

What is the crossover in audience size between Streaming and DRM Radio Broadcasting

Nationwide News and Information Station over area of UK	40,000	590 kW	590 kW (MF)	100%
Local FM broadcaster covering 625,000 people in 4000 km <sup>2</sup>	120	2.0 kW	2.0 kW (VHF Band II)	100%

Assumes internet based streaming consumes 250W per GByte of data streamed

# What is the key to enabling the benefits for DRM broadcasting?

- The technical standard is complete, published and open – ready to use now!
- The Transmitter technology is mature, available and cost effective, now!
- The content management, delivery and transmission systems are available now!
- DRM fully coexists with analogue broadcasting - the spectrum is available now
  
- There are no barriers to use for broadcasters and administrators!
  
- All that is needed now are attractive, cost effective, easy to use, easy to power listening devices !!!!!

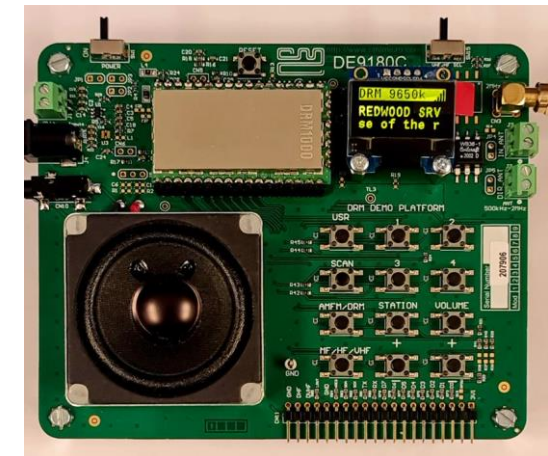
Often known as Receivers!

# The CML/CC DRM1000 DRM Receiver module

- Jointly developed by CML Microcircuits (CML) and Cambridge Consultants (CC)
- A core component to implement a full DRM capable broadcast receiver covering all bands
- Only 45mm x 25mm x 3mm in size
- Tuning 150kHz to 108MHz with no-gaps and supporting AM/FM/DRM broadcasts
- Antenna to speaker solution including simple portable radio UI without a 'host'
- Serial port control for more complex devices using a 'host' to facilitate an advanced UI, display of data services (Journaline) or embedding in other devices
- Less than 350mW power consumption @ 60% volume driving a 1W speaker in all use cases – no power penalty compared with analogue broadcasting
- Meets DRM Consortium Minimum Receiver Specification v4.2, support for Emergency warning function, alternative service frequencies etc.
- All DRM modes and codecs included
- Use of the module includes license to use all relevant patents and IP as used in the DRM standard by the receiver manufacturer
- A pre-engineered building block to allow local manufacturers to flourish in their 'home' markets
- Key Benefits: **Power**, **Size**, **Cost**



30+ hours from 3 AA cells  
(assuming 100mW to speaker)  
Or rechargeable with solar and / or  
hand-cranked charging

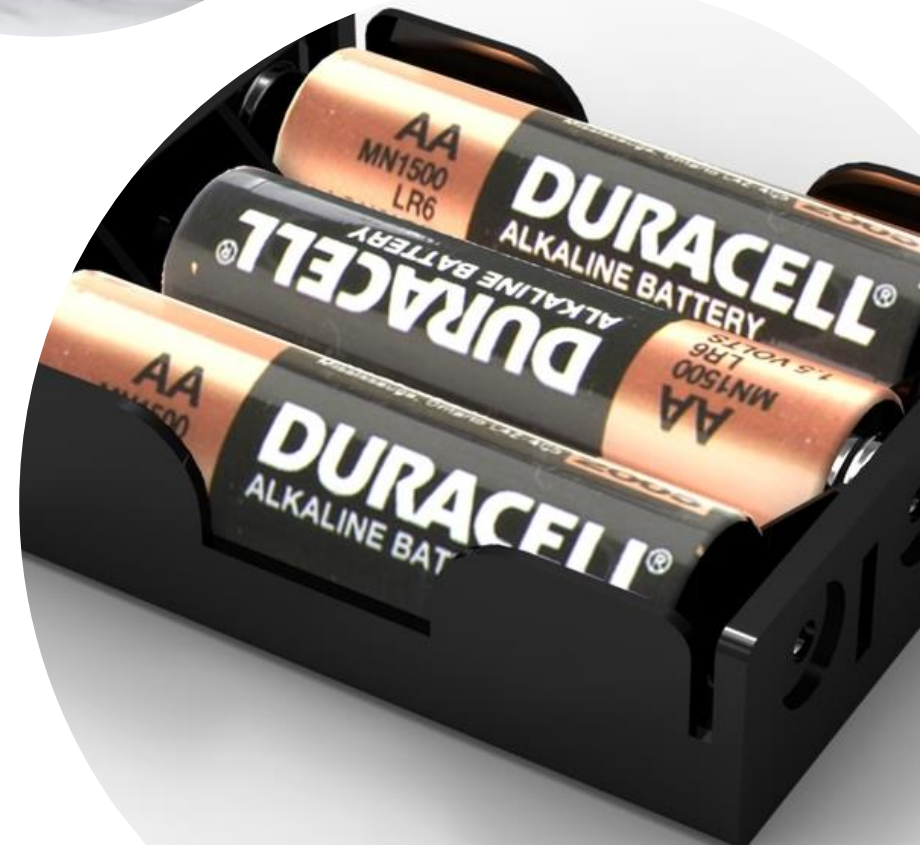


# DRM1000 – Technical Realisation

- DRM1000 integrates three main IC's in its design
- CML, CMX918 a single IC Software Defined Radio Tuner IC covering 150kHz to 108MHz, operating at 3.0V supply and 25mA current consumption
  - Low 1<sup>st</sup> IF architecture, Front end and IF amplifiers, Fractional-N frequency synthesiser, Integrated VCO, Image Rejection mixer, 16bit ADC's and programmable digital channel filters
- Very low power  $\mu$ C with DSP originally designed for IoT 'edge' processing applications running a CC developed software baseband, AM, FM demodulators, DRM OFDM demodulation, all audio codecs filtering and user interface handling
- CML, CMX655 audio codec and class 'D' 1W speaker amplifier
- Power and battery management functions are also included

# Why is low power a breakthrough?

- A DRM1000 receiver will play for 30 hours continuously on 3 x AA cells
- 12 hours play time from a 1200mAh rechargeable
  - 5 to 6 hours of daylight on a 16cm x 7.5cm solar cell to recharge
  - Typically 10 mins of 'hand-cranking' to recharge





# Why is size a breakthrough?

- Small size allows attractive convenient consumer devices with DRM listening at their heart
  - True Pocket Radios
  - Smartphone Accessories with embedded DRM
    - Wireless Speakers
    - Headsets

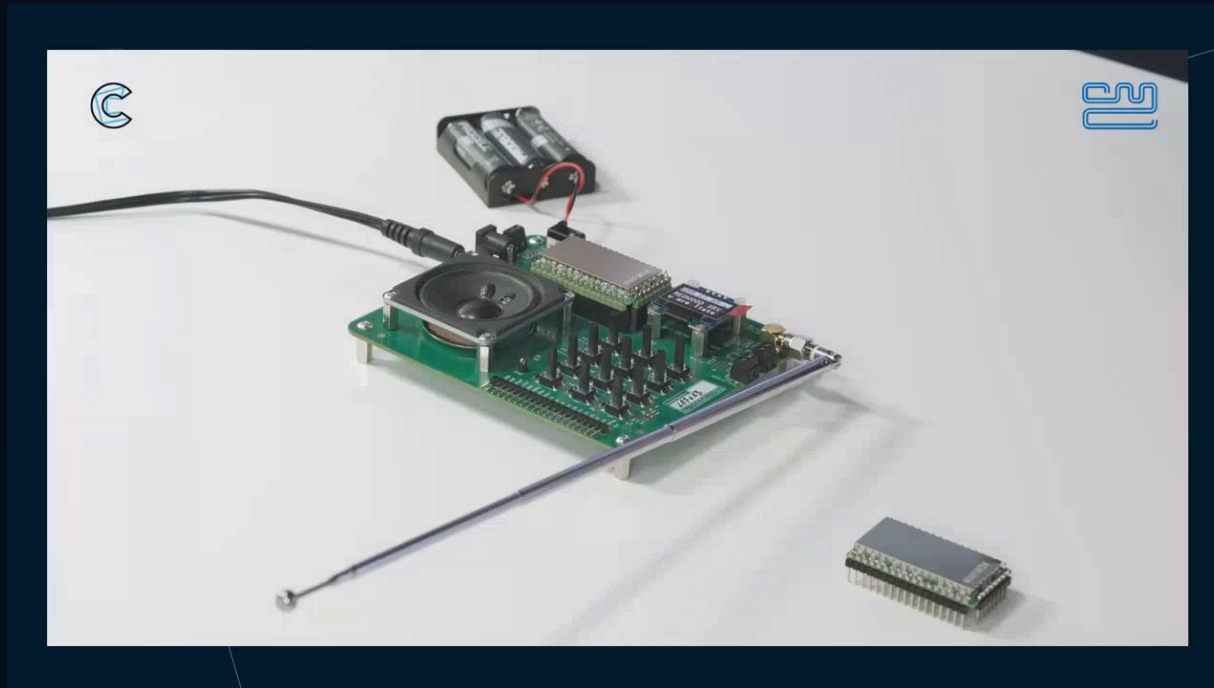


# Why is cost a breakthrough?

- DRM broadcast infrastructure can cover millions of listeners at low cost
- DRM broadcasts can inform and educate at low cost
- DRM broadcasts can enrich peoples lives with music, drama and culture
- DRM broadcasts are 'free to air' – no monthly fees, no service charges
- Cost effective DRM receivers with 'free' energy recharge reach millions of low income citizens and 'connect' the 'unconnected'

# DRM1000 current status and summary

- The DRM1000 is in its final development stages
- All functions and modes now operational
- Meeting DRM Consortium and ETSI receiver standard specifications
- Demonstrating to customers now
- Final version module and firmware slated for completion end of Q1 2023
- Available to buy globally from early Q2 2023



Thank you