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Our Ref : CML_TRAI_11/24

To: Telecom Regulatory Authority of India (TRAI)

Further to your Consultation Paper No. 14/204 on 'Formulating a Digital Radio Broadcast Policy for private Radio broadcasters'; dated September 30th, 2024.

CML Micro is a leading supplier of integrated circuits and modules for wireless communication systems globally. For over 50 years we have been supplying the world's telecommunications companies with core technologies that have helped deliver the wireless communication revolution seen over that period.

CML Micro is a member of the European Technical Standards Institute (ETSI) and the Institution of Electrical and Electronic Engineers (IET) and has been an active contributor and developer to global standards from both organisations. We believe our background in communications will be useful to TRAI in their considerations.

CML Micro has expertise that optimises the cost of consumer devices and ensures long and useful performance from battery powered equipment. We believe our world leading and long-term experience can help inform TRAI as it assesses options for digital radio broadcasting for private stations in India.

As part of our development of devices and core technology; CML Micro has developed the DRM1000 receiver module. With the DRM1000 it is straight forward to develop and sell DRM capable receivers in high volume at consumer suitable pricing. The DRM1000 has been evaluated by a leading broadcaster in India and is designed to enable competitive and cost-effective receiver supply by industry in India. CML Micro fully supports the 'Make in India' objective.

CML Micro offer the following observations for TRAI's information as they consider the best solution for India.

Q1. Do you agree that single digital radio technology adoption is preferable for the entire country? If not, support your reply with justification.

We consider a single solution for all broadcasting bands and all geographies in India is an imperative. If multiple solutions are adopted this can only fracture and harm the market for digital radio broadcasting.

Broadcast radio is a "network technology" that requires the buy-in from all stakeholders and therefore a commonly agreed platform technology and standard. It is notable that in these circumstances proprietary technology where a single company controls both the broadcast and receiver technology/module market has historically been shown to be non-optimum.

We use as a case study the contrasting market rollouts of Digital Cellular technology (also known as 2G) in North America and in Europe.

North America made a policy decision that allowed multiple competing technologies to be adopted, and this resulted in three technically different systems being deployed in the market.

- Digital AMPS (based on 3-slot Time Division Multiplexing)
- CDMA (Code division multiple access – a proprietary technology developed by Qualcomm)
- GSM (Global System for Mobiles – The open ETSI developed standard used by T-Mobile in USA and all operators in Europe)

The result for North America was more expensive handsets than in Europe and Asia due to lower economies of scale. Phones which could not 'roam' countrywide leading to customers having to buy more than one phone. Customer dissatisfaction with the North American mobile phone operators and unflattering comparisons with other parts of the world and markets.

In Europe and most parts of Asia a single open harmonised standard (GSM) was adopted. The use of a single standard gave higher consumer satisfaction and more rapid transition from analogue to digital networks. Universal coverage and roaming were widely appreciated across large geographic regions, phone costs were lower, and competition between suppliers based on the single open standard, delivered far better outcomes for users, networks and society at large.

It is notable that the first-generation iPhone was a GSM based 2.5G (GSM,GPRS,EDGE) mobile. There were no CDMA or D-AMPS variants. Having the 'best' phones only available on GSM networks drove subscribers to choose an open standard network when possible. South Korea having initially chosen proprietary Qualcomm-CDMA, subsequently switched to a 3GPP-ETSI open standards based 3G network. Qualcomm also switched market strategy and became a key supporter of the 3GPP-ETSI open standards process.

Given that DRM is now formally adopted for rollout in India, Indonesia, China, Pakistan and is recommended for digital radio broadcasting by the African Broadcasting Union (together, more than half the world's population) Adopting the DRM open standard rather than any fractured proprietary standards will ultimately deliver the benefits of true economy of scale for India.

Single unified open standards are in CML Micro's opinion always more successful than closed proprietary standards or multiple standards which fracture and distort markets to the detriment of consumers and society.

The single open DRM standard for digital radio broadcasting, which is already widely deployed in India will deliver:

Cost benefits and efficiency for:

- Radio listeners, through a vibrant and multi-supplier market for receiving devices. Competition supports and creates innovation and cost reduction.
- Broadcasters, through multi-sourcing of transmission infrastructure and content delivery systems.
- India as a whole; through the large cost savings that can be made by using an open standard with only industry standard audio codec license fees and with all technical specifications accessible freely to everybody.

As an observation CML Micro believes that universal open standards are always ultimately chosen in the 'network technologies' market over closed proprietary technologies. The following table makes a short summary of examples for TRAI to consider.

Technology Type	Open standard	Closed Proprietary	Market Result
Wireless Cable Replacement	Bluetooth	Cypress Wireless USB	Bluetooth in use globally in billions of devices since its launch in 1999. Cypress Wireless USB is no longer available
Wireless Data for body worn devices	Bluetooth Low Energy	'ANT' Wireless	Bluetooth Low Energy is sold in billions of devices globally and is supported on every Smartphone platform (Android, iOS etc.) ANT is sold by a few companies in relatively low numbers. ANT is not natively supported by any Smartphone OS
Computer Networking	Ethernet IEEE 802.3	Token Ring	Ethernet and subsequent versions of Ethernet are the only standard now used for wired computer networking. Token Ring and other closed systems have all ceased to be used
Wireless Computer Networking	Wi-Fi IEEE 802.11	HomeRF	HomeRF was developed by a closed consortium of companies rather than a standards body such as IEEE. It is no longer supported or offered. Wi-Fi is the ubiquitous standard for wireless networking.

Mobile Phone Networks	GSM / 3GPP / LTE / 5G	CDMA	The comparison between the Qualcomm proprietary CDMA standard and the open GSM / 3GPP standards has already been presented. The universally adopted standards for 4G/5G are based on an open standards process
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In summary it can be shown that single unified open standards are needed in communication technology deployments to ensure cost effectiveness, efficiency of rollout, and high-volume market adoption. A lesson of history is closed proprietary deployments are ultimately nowhere near as successful as open unified standards. Closed proprietary standards also lack development enhancement and innovation. This is clearly seen from the table of examples above.

From CML Micro's position as a leading receiver core technology supplier we can also highlight that multimode (open + proprietary) digital mode receivers will inevitably have higher costs and shorter battery life than single digital mode receivers. Supporting the legacy AM/FM modes is straightforward from an engineering perspective and does not add cost to digital receivers. However, adding additional digital modes to create an open standard + proprietary technology hybrid; with diverse and incompatible user experiences, will add cost, size and power requirement. This addition will be particularly onerous if the supported standards include separate, independent and accumulating IP royalty schemes or other proprietary restrictive and anti-competitive aspects.

Listening to VHF radio using a Smartphone or mobile phone is of great importance to the market in India. Currently there are no Smartphones or mobiles in volume production that support digital radio reception in the market anywhere in the world. Technical demonstrations are not proof of the ability to manufacture in large volume. Needing to support two different digital broadcasting standards on multiple mobile phone platforms will not be accepted by the Smart/mobile phone industry in CML Micro's opinion. This is despite the large size of the phone market in India. The adoption by India of a single unified open standard (DRM) for digital broadcasting in VHF makes the support of that broadcasting method on mobile phone platforms far more likely (please see the answer to question 2 for further details).

For digital radio broadcasting in India to be perceived as a success by all potential consumers across the large and diverse population of India; simple basic details like choice of listening device, battery life and cost are of great importance. Whilst they can seem 'dry' and overly detailed they make a great deal of difference to essential receiver user experience. CML Micro, would suggest to TRAI that as the regulator responsible for the success of a digital radio broadcasting deployment, getting the fundamentals of acceptable cost, good user experience, wide receiver choice, and high competition driving costs down and innovation up; are all more certain to be achieved by selecting a single open standard for the Indian market.

Q2. In case a single digital radio broadcast technology is to be adopted for the entire country, which technology should be adopted for digital radio broadcasting? Please give your suggestions with detailed justification.

In the opinion of CML Micro, DRM adopted in both AM and FM bands is the only approach for digital radio rollout which will be successful for India.

The reasons for adopting an open non-proprietary standard have already been discussed in this submission at length. There are other important reasons why DRM is the right system for India in our view.

- DRM is already chosen as the digital broadcast standard in the AM bands for India. Also adopting DRM in the FM bands will provide a single unified market and benefit the rollout of digital broadcasting in both bands. The FM band is of course very important for many towns and cities in India but having the AM band service running in parallel ensures that all regions of India and all different parts of society will benefit from digital radio broadcasting. Having all parts of society see the advantages of the new broadcast system, helps national and social cohesion.
- The xHE-ACC audio codec used in DRM is the most data efficient and modern codec adopted by any digital broadcasting system, globally. This at its most basic level means DRM will always make better use of spectrum than its alternatives. In many countries a standard FM radio channel occupies 200kHz of radio spectrum and carries one stereo broadcast. DRM in the same 200kHz of spectrum can support 6 stereo audio stations and 2 data services. This is more efficient than any other competing digital radio technology.

DRM has more capacity than its rivals and if TRAI wishes to maximise license revenue, customer choice and broadcast capacity in dense urban areas DRM is always the superior choice. This fact has been demonstrated by administrations around the world in Africa, Asia and Europe.

The narrow channel requirements of DRM (100kHz minimum at VHF frequencies), ensures capacity for more stations. Coupled with DRM's ability to be deployed as a 'single frequency network' across multiple transmission locations makes spectrum planning simpler for TRAI. It also gives listeners a far superior listening experience. Maintaining good listening experience as they move around the area covered by their favourite radio broadcast.

- At the commencement of digital radio broadcasting DRM allows no change in the frequency planning already in place by supporting full Analogue and Digital simulcast. Once digital broadcast listening is established and successful, DRM also allows for great flexibility to tailor the system to ultimately best suit Indian broadcast requirements in all bands. Only DRM with its highly efficient audio codecs can provide this level of flexibility and adaptability in its deployed configuration.
- DRM is unique in digital radio broadcasting with its ability to fit into channels which are narrower than the preceding analogue system (DRM 100kHz channels vs Stereo Wide Band FM with 200kHz channels). This is of prime importance when considering the use of Smart/mobile phones as personal receiver devices. Smart/mobile 'chipsets' already incorporated VHF radio receivers capable of receiving the 200kHz wide FM broadcasts. In many cases supporting DRM with its smaller 100kHz channels is a software change/upgrade only. The 'chipset' hardware can remain unchanged and used as is. This is UNIQUE for DRM. All other digital radio broadcast systems will require additional hardware to be fitted to Smart/mobile phones. As a wireless chip supplier CML Micro believes it has a very clear perspective on this industry and how it functions. It is CML Micro's opinion that the only digital broadcast system which can in fact be practically deployed on phone platforms is DRM. Any additional hardware cost, even \$0.50 to a phone maker will be resisted by the industry and will make adoption very much harder to achieve in production volume.
- DRM has the integrated Emergency Warning Functionality (EWF). Deployment of this service on both AM bands and FM bands will ensure maximum reach and 'penetration' for warnings when they occur. The use of a single system across both bands will be important to ensure full and successful installation of an effective EWF service.
- DRM has demonstrated its successful deployment for remote education usage. Built upon the 'Journaline' data service which is already an integral part of the DRM broadcasts fully operational in India. Even though India is rolling out Internet connectivity rapidly; DRM can supplement that connectivity with Journaline data in areas and regions where it has not proven possible to rollout Internet connectivity fully. In India, Journaline is already proving valuable with its support for multiple languages and scripts. The 'free to air' nature of DRM broadcasting and Journaline makes it important for populations with very low monthly incomes to be part of the 'digital dividend'.
- A feature of DRM in the VHF frequency band is its scalability. From a single low power transmitter (100W) covering a community with 3 stereo audio stations and a localised data service. To a large DRM Multichannel transmitter (e.g. 50kW) providing 24 different stereo broadcasts and 4 parallel data services. DRM has flexibility. With a DRM based network India will be able to meet many different broadcaster/listeners needs for many years into the future. Low cost and high-performance transmitter infrastructure and receivers are available from a range of supplier and manufacturers both internal to India and from overseas.
- There are a host of clear and verifiable technical reasons why DRM is the appropriate choice for India. CML Micro will leave others to cover those in full technical detail. We will therefore focus our response on the opportunity for India, lost by not selecting DRM as its universal digital radio broadcasting standard.

Digital radio broadcasting and the choices made in its adoption have economic and social implications for broadcasting authorities. The motivation for CML to develop the DRM1000 receiver module is to allow multiple receiver models and manufacturers to flourish around a simple to use and integrate receiver solution. This coupled with the innovation that is stimulated using the unified open DRM standard will allow technology suppliers in India to flourish. A clear open policy will encourage a myriad of receiver suppliers to participate in the market. Receiver types from small personal receivers to 'kitchen portables' to surround sound systems and sound bars with integrated radio functions, even to specialised rugged 'builders' radios.

Broadcast radio is often preferred to streaming services when the listener requires 'curated content'. Curated content is appropriate when the primary focus of the listener's attention needs to be on another activity. The most obvious example is when driving, hence the popularity of broadcast radio in cars and trucks. But there are many other use cases where people are working (construction, agriculture, factories, maintenance workshops etc.) and relaxing where broadcast radio is the popular user option. This fact requires a diversity of receiver types and innovation in their 'look and feel'. This need for diversity and innovation creates a vibrant and dynamic market to be served. In addition to familiar radio receiver types, non-traditional devices such as wireless speakers and multi-room home sound systems can all be made available with DRM digital radio built in.

In CML Micro's opinion all these devices can be manufactured in India, for India, and the world. The creation of an open competitive, and vibrant market for DRM based digital broadcast radio products in India; transmitters, content delivery and multiple receiver types; will create great potential for jobs in India. Those jobs covering marketing, design and manufacturing will be high skill and rewarding jobs serving the digital economy in India. Only DRM holds this prospect due to its open non-proprietary nature. Adoption of a proprietary closed alternative will not deliver this important economic and social development outcome.

Q3. In case multiple digital broadcasting technologies are to be adopted, please specify whether it should be left to the market forces to decide the appropriate technologies and what could be the potential problems due to adoption of multiple technologies? Please suggest probable solutions to the problems, with detailed justification.

As already outlined in this response CML Micro believes the adoption of multiple digital broadcasting technologies would be a fatal mistake for TRAI to make. We also believe that the North America vs Europe experience of introducing digital mobile phone technology starkly shows that in network technologies 'letting the market decide' only leads to higher consumer costs, market confusion and significant market dissatisfaction with the outcome. This mistake in mobile phone deployment was ultimately corrected in North America in subsequent network deployments, but this will not be possible for digital radio broadcasting deployment in India. From CML Micro's perspective there is a stark choice, and DRM represents the only right way forward for India, its listeners, consumers, industry and social / national wellbeing.