

# Wireless Connectivity

*“It was supposed to be so easy!”*

*Mike Meakin, Innovations Manager of Low Power Radio Solutions tells us why modules are still the best solution to embedding low power radio within a product.*



Over the years I have heard this plea many times: “Could you please come and talk to us? We’re working on a project using low power radio and we just need a little help and advice.” The conversation and sorry tale goes something like this: “My boss started this project about a year ago and we are now way behind - we’ve encountered a few unforeseen problems and frankly it’s now getting very embarrassing. I have dared hardly tell him where we are with this project!

The decision was made that we would add wireless communication to our product line and we would design/build our own integrated radio using an RF IC. The chip manufacturers provide a wealth of design and application information and made it sound so easy. It was also ‘cheaper’ than buying an approved radio module.

After some considerable research looking at various devices we decided upon what we thought was a suitable device from an established company. The datasheets (all 150 pages) and the application notes were downloaded and carefully studied. It all looked straightforward and all went reasonably well until we tackled the device firmware. It wasn’t initially apparent that we needed a thorough understanding of how all the functions/blocks in the device worked and the importance of knowing exactly how all the multiple registers interacted. This was hard work.

We then had to devise a communications protocol to suit our specific needs. This also took longer than we anticipated. Concurrently our printed circuit board designer was tasked with laying out the boards and in hindsight we learned that RF design was not something that he had much experience of!

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The antenna proved to be another troublesome decision for us, as for product appearance reasons we chose a compact PCB type antenna. Sadly at the time we didn’t realise the performance limitations of the type of antenna to which we had committed.

Slowly the design came together and we then had a more serious chat with our favourite test house about obtaining radio approvals along with the required CE (European) product approvals. Whilst they were most enthusiastic and helpful we became concerned that this was not going to be as easy as we were hoping. We were particularly hoping to obtain additional (FCC) approvals to allow the product to be used in the United States, one of our biggest markets.

By this time ‘questions were being asked’ by management on progress with this project and the projected time scales for completion which were slipping badly. This pressure was compounded by our initial range tests which were very disappointing and did not even meet the product design specifications. The RF IC manufacturers’ application engineers offered some helpful but distant advice as did their other users on their web forums, some of whom became familiar friends as we shared our various woes and work arounds.

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Several time consuming minor product iterations and software 'mods' were needed after we undertook the essential (and recommended) 'confidence tests'. It was therefore some time before we were actually 'confident' to order and undertake full testing!

The testing went reasonably well apart from some FCC 'infringements' which we still haven't been able to fix. The documentation requirements for FCC approvals were daunting.

So, the whole project is over time, over budget and we still can't sell the product in the United States yet. We are not going to do this again! In hindsight we think we should perhaps have used an approved radio module – convince us!"

I usually reply: "Yes, you are right! An approved radio module would have considerably eased your pain. You could have used our evaluation kit to quickly determine (within minutes) whether you would get the required range with your chosen antenna. Using the provided easyRadio Companion software you could have changed frequency/channels, transmission power, over-air data rate and other key parameters to observe the changes in real world performance.

Hooking the module into your existing product would have been so simple requiring only a serial coms port or logic level UART interface to your processor. There is no need to write any complicated software to drive the modules - just serial data in, serial data out at up to 250 bytes per packet. No need for complicated bit balancing, sync data detection, CRC/checksums etc. - this is all done internally and it just works!

Your PCB design would also have been considerably simplified. No need to use an expensive four layer RF PCBs where they are not required.

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*"Yes, you are right! An approved radio module would have considerably eased your pain."*

What is more, our modules are fully approved which will save not only time and money but the considerable worry of failure, repeated testing and being humble to your boss.

OK, so now you're going to mention the cost of buying the 'expensive' modules. Yes, of course they are more expensive than the cost of the components alone but you are buying far more than just the components and the assembly. You didn't mention the cost of the test equipment that you had to buy to both develop your RF circuitry and test it after production. You then didn't mention the cost of procuring and stocking specialist RF components.

Finally the peace of mind, certainty and your sanity must be worth something? Convinced yet?