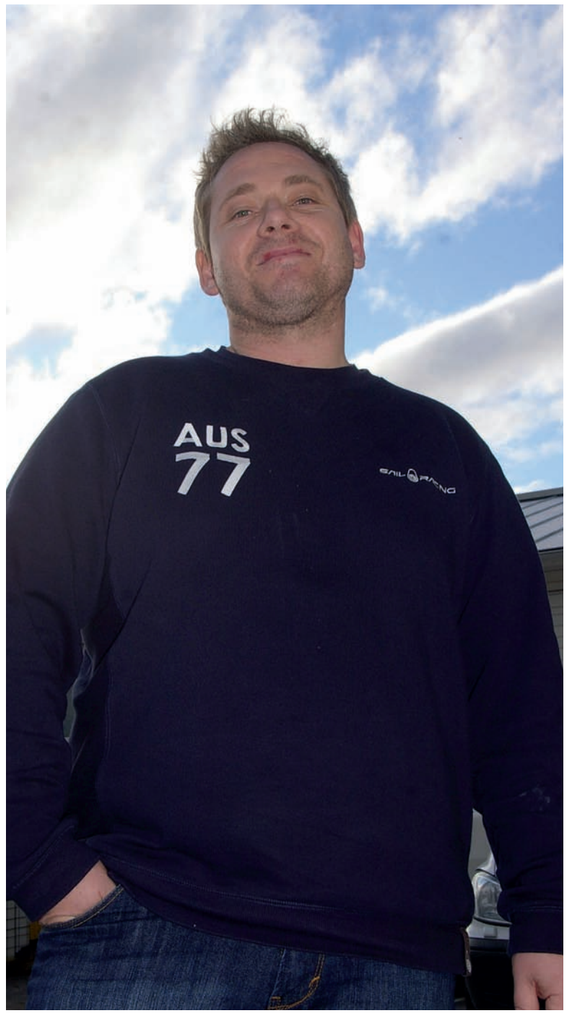
“AT THE END OF THE ‘80s, THERE WERE FEW RADIO MICS, BUT MY TARGET IS TO GET WIRELESS LIGHTING CONTROL ACCEPTED IN THE SAME WAY AS THE WIRELESS MIC.”

NICLAS ARVIDSSON

Wireless DMX technology in many respects, is still in its infancy, and some are still sceptical of its capabilities. Jerry Gilbert travelled to Uddevalla - 90km north of Gothenburg - to discover the facts of the technology from wireless expert, Niclas Arvidsson, founder of Wireless Solution.



Anyone set on pioneering new technologies in the entertainment niche sector is either irrationally heroic or has extraordinarily large cojones. Take in-ear monitoring. How bonkers was that? How could it ever be expected to replace the good old fashioned stage wedge? These 'black art' technologies shroud themselves in an impermeable lexicon of acronyms and neologisms that require a cryptologist to decode them, while the protagonists engage in fierce competition. Yet these frontiersmen are to be commended as they usually prove to be the cornerstones of the industry's next generation.

Joining the field of available networking protocols this past few years has been wireless DMX technology. Many methods can be used for wireless data transfer - cellular phones, PDAs, GPS, radio receivers, satellite TVs - with modern DMX enhancements including Remote Device Management (RDM). Meanwhile, signal fidelity is achieved using dual-band and Adaptive Frequency Hopping (AFH) and Cognitive Coexistence techniques.

DMX512 is, of course, the universal digital multiplex theatre lighting standard, and it was probably only a question of time before it was discovered that, in installations where cable lengths were prohibitively long, by placing a wireless transmitter at the controller end, with receivers near the fixtures (to convert the wireless signal back to conventional DMX512 wired network signals) such distances could be overcome.

Pioneering the genre in Europe (and slowly galvanising the lighting community), has been Niclas Arvidsson. Founder of Swedish company Wireless Solution Sweden, its catchy W-DMX brand has steadily been infiltrating the production lighting industry since 2003. Today, four product generations after launching its fairly primitive hand-made point-to-point G1 prototype at the 2004 SIB Show in Rimini, the technology has moved on exponentially to this year's new BlackBox G4 Mk2.

So where has it all come from? The technology originally developed through using frequency hopping spread spectrum (FHSS) technology, first used by the US Army to attain more reliable data transfers (changing frequency more than 1,000 times every second). Spread spectrum signals are highly resistant to narrow-band interference and are thus difficult to intercept. The hopping system is used in the same license-free 2.4GHz frequency band (W-Lan for instance uses 20MHz channels) enabling W-DMX to get 79 channels out of the system. This has now evolved further into the Adaptive Frequency Hopping (AFH) spread spectrum, which improves resistance to radio frequency by avoiding using crowded frequencies in the hopping sequence (the idea being to avoid the 'bad' frequencies and use only the 'good'. In other words to avoid transmitting on occupied frequencies.

So much for the basic primer. Armed with little more than that, I set off in search of Niclas Arvidsson, on the day that President Gadaffi was shot dead, unsure of whether I was about to conduct a press interview for **mondo*dr** or try and cram a three-year Masters Degree into a single day.

We met up at his base in Uddevalla, 90km north of Gothenburg. Not yet 40, Niclas

> "People were only prepared to use wireless DMX when cable was not possible and even today rental companies are thinking more about using wireless to save on installation cost."

Arvidsson has long been a familiar presence on the global exhibition circuit (and in various professional groups). My instant impression was of a kind of Nordic Robert Downey Jr.

Niclas Arvidsson had forged his career out of the rental and distribution industry of the early to mid '90s. Like so many he had been beguiled by the magic of the SIB expo in Rimini and Italian product styling. Arvidsson ditched his aspirations to become a DJ at the beginning of the '90s, "I had bought all the equipment before I realised I couldn't beatmix," he said. And he set up his distribution company, Interlite AB in 1994, with SGM becoming his first supplier. He sold his rental business, temporarily diverted into sound distribution - and a new base in Upssala - before reverting to his core interest, back in his home city of Uddevalla.

The concept of wireless DMX was already appearing in the States by the second half of the '90s, notably through Goddard Design in New York, which was focused on theatre, and later by Interactive Technologies' award-winning Radio DMX, which

Wireless Solution's annual Swedish Vodka and Meatball Party at LDI

introduced the nascent technology to the international marketplace.

But Arvidsson could see that by adapting off-the-shelf modules and then converting it to do DMX via a dedicated interface made the end product prohibitively expensive in the volume market. It had to be an easy to use plug 'n' play system with fast transmission.

Sensing that the technology needed to be driven from the lighting end, it wasn't until the year 2000, when he started to think what might be possible with wireless lighting control, that he sought the right partners, and teamed up with former employees from Swedish mobile phone giants Ericsson. By 2003 he was ready to launch. There were several key parameters in his design mission, and these were ease of use, good quality and good price (he immediately succeeded in reducing price by 50% in the first generation products). In addition, wireless DMX had to overcome market scepticism about signal security when removing cable, and also address the price issue. "People were only prepared to use wireless DMX when cable was not possible and even today rental companies are thinking more about using wireless to save on installation cost."

The piece of good fortune Arvidsson had was being able to take the name of a company called Wireless Solution, which had gone out of business the year before, and simply re-register it as Wireless Solution Sweden, adding 'W-DMX' as the catchy brand name - short for wireless DMX. "With that name no-one was in any doubt what we produced," he reasoned.

Following its SIB launch, by the Autumn of 2004 Wireless Solution was already into its second generation, launching the improved G2 W-DMX BlackBox, with a newly extruded chassis, XLR / USB connectors and one button operation in London, where it scooped the PLASA Innovation Award. It was the first of several prestigious industry awards that the company would collect, including the LDI Most Promising Debut Award the following year. "We had overcome problems such as having to set an IP address for each DMX universe - it was now done automatically and synced, with one button operation. We also adopted a universal power supply while others were using external transformers."

However, the major step forward was the G3 box. "It was higher quality, using a die cast, heavy duty chassis, and it provided a lot more functionality for the user. We could see how rental companies would be able to make greater use of this product."

Yet again SGM was quick to respond to W-DMX, becoming Arvidsson's first OEM partner, and integrating the wireless technology into the Palco and Synthesis products. SGM also put the wireless DMX box in its price list so clients could buy the transmitters. "They were the first to use high power LEDs - and the wireless feature was a real selling point," remembered Niclas.

By PLASA 2005 early wireless receivers and transmitters had evolved into all-in-one transceivers; the company unveiled its W-DMX IP65 Transceiver, alongside the W-DMX IP65 repeater, enabling customers to overcome long transmission distances and building height differentials. By 2007 more output power, greater reliability and further distance coverage was made possible and Wireless Solution launched the W-DMX G3 BlackBox S-2 and T-1 - the first plug 'n' play transceiver as well the first dual universe system on the market. This eventually led to the new G4 BlackBox F-1 and F-2 - launched last year - incorporating Adaptive Technology, Invisi-Wire, Data-Safe and other technologies, streamlined further with this year's W-DMX BlackBox Mk2.

> "There is no wireless box on the market that offers all of the above, and Wireless Solution comes at a price that is 40% less than the competition, and all made in Sweden."

Of this product, Niclas explained: "Ever since we designed the G1 it was about how we could hang the box. So we produced a Quick Lock system for the Mk2, with two L brackets for standard 19-inch rackmount, a DIN-rail system, with Powercon and Ethercon (instead of RJ45) all in one box. "There is no wireless box on the market that offers all of the above, and Wireless Solution comes at a price that is 40% less than the competition, and all made in Sweden."

The company has also made huge reductions in OEM PCB prices, compared with lower-featured Chinese equivalents, because it is geared up for volume production. "We only have one component that needs to be mounted outside the SMT assembly line," he said. Today the company has around 35 OEM customers, the bulk of them preferring to incorporate the transceiver option. As the demand increases it is starting to build stocks of the cards, to enable it to supply smaller companies that cannot forecast one-off events so easily. Out of every ten boxes the company makes, six will be transceivers.

One major company that has installed W-DMX as standard in its new Glow-Up ▶

Niclas with colleague Shelly Li

> "We were the first company on the market to take a different approach to making a product that was easy to use, cost effective and using advanced technology to ensure safe transmission."

and Igloo fixtures is Clay Paky, with the transceiver card operating in a master / slave scenario, broadcasting to all other fixtures in receiver mode. One of the big mistakes made by other companies, Arvidsson believes, is that they are concentrating first and foremost on being a wireless technology company. "But we are a lighting company which happens to focus on radio. The bulk of our feedback comes from manufacturers, distributors and rental companies - such as PRG in Belgium and rental and theatres in Sweden, with whom we work and support directly."

How does this support manifest itself? "Sometimes customers need help with different antennas but one of the most common challenges is distance. A standard box with European output will cover 500 metres line of sight, and if you have units three metres from the ground then you will have 95% signal strength."

The new G4 has built-in redundancy whereby all the data is sent twice. "This back-up feature we call 'Data-Safe'," said Arvidsson. "Even if we lose a DMX package, in a crowded situation the system will still accept a 50% drop as the re-send is so fast. This improved function provides the user with greater security and reassurance."

Look at Arvidsson's LinkedIn profile and you will see a mass of affiliations to different boards, standards, associations and advisory groups. Wireless Solution is a voting member of the RDM Task Group and the new protocol, commonly called "streaming ACN", which details DMX-style control over TCP / IP networks. Wireless Solution is also a participant at the PLASA Plugfest (previously RDM Plugfest) held most recently in July in Texas.

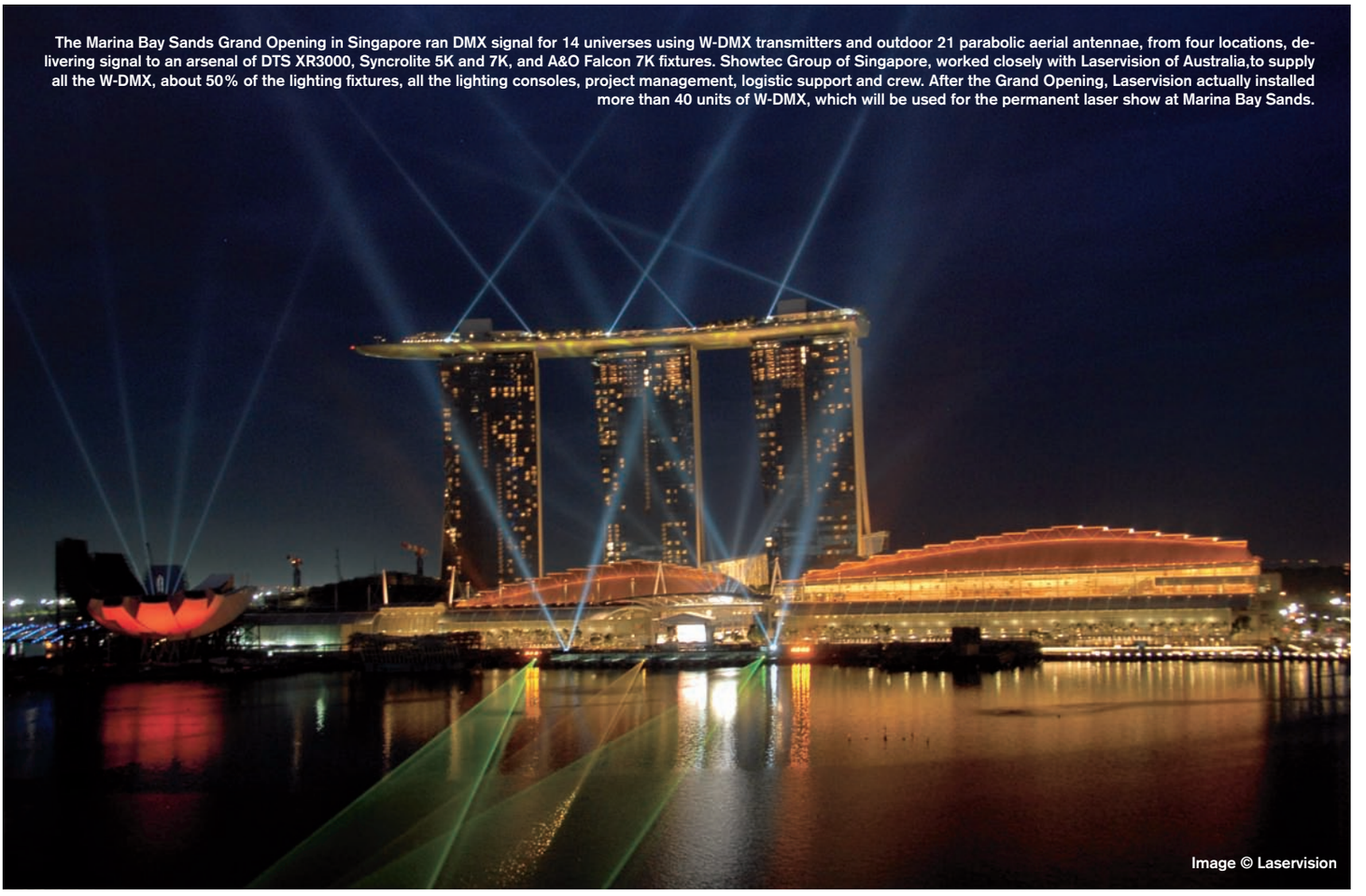
So what of RDM, the protocol enhancement to DMX512, that allows bi-directional communication between a lighting controller and RDM compliant device over a standard DMX line? Arvidsson believes RDM has more relevance for installation use, while remote addressing is more important for touring. "RDM can save a lot of cost. You can run a manual diagnostic and get it up on a PC screen and implement your own unique PID. There is also a lot of 'on the fly' stuff you can do with RDM. On the PC screen I can see how good the signal strength is, while there are a lot of small functions which are useful for wireless RDM; any controller supporting it will be able to show these functions by listing all the RDM commands."

With so much weird science in the ether education becomes a byword, and Arvidsson's mission is that by undertaking constant seminars, he will help to expand the size of the wireless DMX universe. For the last four years he has conducted a one hour training session at PLASA, and has gone further, sponsoring initiatives such as a youth enterprise scheme. "This year at PLASA we talked about wireless RDM but it's still very early days, and there are still companies that don't put it into their fixtures. In fact one of the biggest problems with wireless generally is when our distributors say their clients don't want wireless DMX. I say, 'have you bothered to ask them?'.

"A lot of manufacturers are saying they are RDM ready, but aside from a few European and American companies, it is the Chinese who are adopting it most quickly, as they see it not only as a useful technical feature, but also a sales pitch. In fact our biggest clients in volume for the DMX cards are also the Chinese - and we now have all the major Chinese manufacturers using wireless." Knowing Arvidsson's predilection for developing the Asia and Chinese markets don't bet against him opening up a facility there anytime soon to meet customer requests in the local market, with a view of simplifying import duties.

At the end of 2009 the company entered negotiations with City Theatrical about licensing the wireless RDM patent that is valid in USA. After a couple of months an agreement was reached which was formalised at LDI 2010. "This is an important co-operation between two companies using wireless technology as the USA is an important market for us, as well as our OEM clients," said Arvidsson. With this agreement Wireless Solution Sweden is currently the only European producer of wireless DMX / RDM, selling in USA, that is fully covered by the City Theatrical patent. "We at Wireless Solution see this as an important agreement, as this protects all our clients - end-users, dealers, distributors and OEM partners - from the risk of any legal problems," he said.

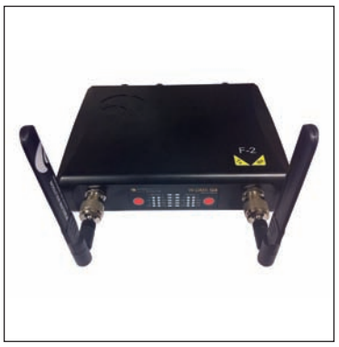
One major American-based project starting next year is construction of a new 550ft high roller ferris wheel. This will be the highest in the world and follows ▶



The Marina Bay Sands Grand Opening in Singapore ran DMX signal for 14 universes using W-DMX transmitters and outdoor 21 parabolic aerial antennae, from four locations, delivering signal to an arsenal of DTS XR3000, Syncrolite 5K and 7K, and A&O Falcon 7K fixtures. Showtec Group of Singapore, worked closely with Laservision of Australia,to supply all the W-DMX, about 50% of the lighting fixtures, all the lighting consoles, project management, logistic support and crew. After the Grand Opening, Laservision actually installed more than 40 units of W-DMX, which will be used for the permanent laser show at Marina Bay Sands.

Image © Laservision

"There's quite a big difference in character between the 2.4GHz and 5.8GHz bands and we wanted something that can be manually selected between the two bands."



Wireless DMX's success with the Singapore Flyer (the current largest). "We will provide a wireless transmitter and receiver, but as the transmitter is very close to the wall the antenna has to open up very big. We will work with our distributor [ACT Lighting] to choose the right antennas and accessories, but most importantly work with the technical specifier to do proper planning, because although the distance isn't large it's a moving object and you can have up to 50% less signal strength."

Today, Arvidsson enjoys a high profile on the international circuit - but how is he regarded by his peers? Describing his company as a "trend setter", some may regard his attitude as cavalier, particularly with the statement on his website that the Wireless DMX system is, 'today the unofficial standard for those that require the most dependable product available for transmitting lighting control data wirelessly, no matter the distance or location'. But his claim is tough to challenge. "Most of the people in the industry I get on with. When you have spent 20 years in the business you have to - especially when you are talking OEM business. As for that statement it is based on the fact that we were the first company on the market to take a different approach to making a product that was easy to use, cost effective and using advanced technology to ensure safe transmission. We are also the company with the most OEM partners."

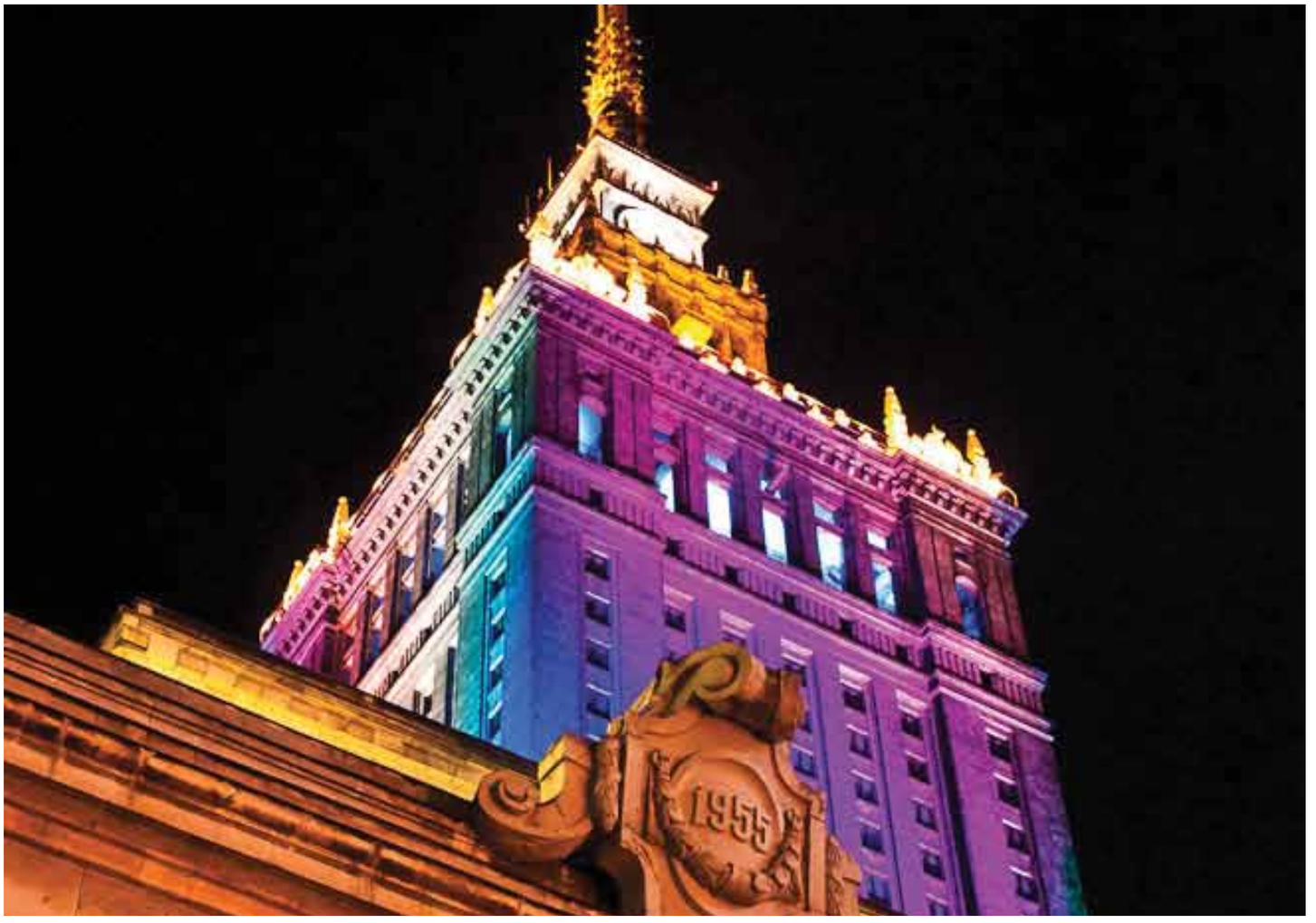
Another web statement he was eager to clarify was, 'we don't have any competition, except signal cable'. "What I meant by that was that our biggest competition is cable and it's aimed at people who are afraid to use wireless lighting control. Of course there are some brands on the market that provide competition but as the market grows, year on year, this is not the biggest problem. There is room for several providers in what is a growing market."

Of Wireless Solution's various associations, the most important by far is with the global technology group Norautron, the locally-based production house based in nearby Vänersborg, which has been prototyping and manufacturing its products exclusively since the G3. "Norautron offers us scalability and they are prepared to be flexible, which is an important part of the partnership; two people working full time produce the full line of radio and the complete units." They do this with the support of a 3,000 sq metres production plant, with modern test equipment and surface mount assembly lines. Some 4,000 - 5,000 radio cards are produced every month, helping to account for Wireless Solution's 35% hike in turnover on the previous year. In fact in 2011 it also produced around 50,000 units of W-DMX - a new record.

"From three PCB's we can make ten different products," Arvidsson said. "The idea is to have a flexible production with similar components so we can change batches at no notice. Although standard rating for weather-resistance is IP65 with small modifications, such as coating the PCB and cable glands with lacquer, and using metal instead of plastic we can uprate this to IP67."

This has enabled Wireless Solution to restrict its own personnel to a maximum of 14 sales, admin, R&D engineers and support staff, based at the 500 sq metre, two-storey facility in Uddevalla, which it moved to in 2006. According to Marcus Ek, the W-DMX Account Manager at Norautron, a significant turning point was when the G4 switched to the dual band (2.4GHz and 5.8GHz). This has been achieved by taking the 2.4 radio chip and using a transverter (upconverter / downcoverter) to upgrade to the licence free 5.8GHz.

The G4 also provides the ability to repair corrupted data and create maximum security and a backup duplicate of the signal. Changing frequency provides a lot more flexibility due to the heavy traffic on the 2.4GHz band. "There's quite a big difference in character between the 2.4GHz and 5.8GHz bands and we wanted something that can be manually selected between the two bands," ▶



stated Arvidsson. "It is user-selectable on the transmitter and all the receivers will auto negotiate with the transmitter side. The 5.8 band has more problems coming through the walls, and the higher the frequency the shorter the distance it can travel. However, generally for indoor jobs, such as exhibitions, where there is a lot of radio traffic and the distances are not so great then you go to 5.8GHz - in that way you avoid wireless steadycam cameras on 2.1GHz and, mobile phone jammers - both of which work in a similar way. They are causing so much noise interference on the 2.4GHz band, because the output power is so extreme."

In fact the G4 platform has made a quantum leap. Aside from offering bi-directional data transfer it also embraced Adaptive Frequency Hopping, explained earlier. "This enables us to build up a history to see if a channel is interfered over a long time, so we will only remove 'bad' channels selectively."

Meanwhile, other network protocols are striving to establish themselves in other parallel sectors. For example commercial lighting uses the DALI protocol, designed as a successor to the analogue 0-10V, and is principally a standard for fluorescent lamp ballasts. It has hardly taken the market by storm but then W-DMX has not become universal yet either. Will the lighting industry ever lose its security blanket of wired connection so that it catches on in the way that radio mics did? Arvidsson believes that it will. "At the end of the '80s, there were very few radio mics, but my target is to get wireless lighting control accepted in the same way as the wireless mic. Obviously the audio business is much bigger, and lighting has more parameters; but wireless control is not only for situations where cable is not possible, but to save time, money, and be more flexible and creative."

After seven hours in the company of this engaging entrepreneur it struck me that his ambitions could possibly best be summarised as "dynamically modest", for principally he is an evangelist for the technology. "My target is to be able to grow at a decent rate, but I am aware that the bigger you get the more problems you will have. Presently we are a comfortable size. "We are spending 20% of our turnover on R&D and marketing events because the most important thing is striking a balance - finding a middle path between product and market development. It's not always about having the Ferrari. As for Interlite, we did have an office in Stockholm and we will reopen again next year as it's important to be in Stockholm." Replying to an unasked question, he stated: "If I were ever going to sell Wireless Solution I would only do it to someone who would care about it, [rather] than just to sell for money. There are too many venture capitalists and I see no place for them in the entertainment industry, which is only a niche market."

Meanwhile he is perfectly happy to continue his empirical journey into further uncharted waters.