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ELECTRONIC DEVELOPMENTS IN AIR TRANSPORT

Two major exhibitions were held in London in September which highlighted a number of electronic developments in the field of air transport. The first was MRO Europe sponsored by the journal *Aviation Week* (London ExCel, 24th. to 26th. September), the leading event for aircraft maintenance, repair and overhaul. The second was Helitech International, which ran in parallel and provided a somewhat smaller, but no less interesting showcase, dedicated to the more specialised field of helicopter operations.

In this issue of *The Electron* a selection of articles is presented from both of these events focusing on electronic applications. This is followed by a selection of features from the 39th European Conference on Optical Communication (ECOC) and its supporting exhibition, which also ran concurrently at London ExCel from 22nd to 26th September.

MRO PROVIDERS USE BIG DATA TO IMPROVE OPERATIONS

In the MRO Europe sponsoring journal (*Aviation Week and Space Technology*, September 23, 2013) Bob Trebilcock Keene, N.H. presents an article with the above title which explains how data collection technologies, computing power, algorithms and analytical software tools traditionally used by The National Security Agency to search for patterns among millions of seemingly random communications, and by Amazon and Facebook to target advertising messages to consumers, are now being applied in the commercial aviation industry to solve a variety of problems. The author uses four case studies to illustrate.

Lufthansa Technik: Predicting Failure, Reducing Inventories

The Lufthansa Technik case illustrates how the use of historical data to develop preventive maintenance for critical parts has been replaced by a programme of information gathering from multiple sources such as sensor data, operational and

flight data, pilot and crew reports and flight schedule information with a view towards optimisation.

For this a data centre is used, which can then be ‘mined’ in order to better understand why faults occur and how better to improve the repair process.

The author explains how new algorithms are being created to correlate data from sources that may not have been previously considered in order to identify wear patterns on components. An example is an algorithm to monitor historical data from a sensor on a pressure-regulating valve.

This ‘Big Data’ concept is now being extended to enable a better understanding of wear patterns at a granular level. This is hoped to lead to the ability to customise maintenance programmes to specific aircraft operating in particular geographies as opposed to the present generalised preventive maintenance schedule.

The conclusion that is reached is that with the right data the entire supply chain can be optimised.

Aerexchange: Using Big Data to create Community

In this case study the author highlights the fact that ‘Big Data’ can be used in two different ways:

- (i) To create new models that challenge the way business is done (as with Google, Amazon and Facebook).
- (ii) To create an electronic community with access to more information and a streamlined means of communication.

Aerexchange uses the second approach with the objective of creating an online collaboration platform for spare parts. This is therefore not just about data generally, but also about such things as the transmission of service records, bulletins, completion data, serial numbers, parts history and reliability information between supply chain partners in a secure environment. Whilst in the past such data has tended to be maintained in different locations, with improved computing power the data can now be aggregated and organised much more effectively.

The concept is illustrated with reference to the servicing of complex components such as landing gear where historically a large document stack would exist stored in a vault – available but difficult to use in a seamless way. Powerful computers, secure internet communications and cheaper digital storage are now revolutionising the management of such data for large complex systems.

Satair: Using Big Data to manage Consumables

Satair are a Danish parts and service provider and their case involves the management of consumables provided to a fleet operator.

The objective is to bring together historical and live real-time usage data from operators, including operational data from aircraft that are currently flying, in order to make unscheduled maintenance events more transparent.

It is explained how, when aircraft are brought in for inspection, there will usually be knowledge of some of the items that will have to be replaced, but not all. Some only reveal themselves during the inspection.

With Satair's approach improvements in predictive data lead to both time and inventory improvements throughout the supply chain, with greater predictability for when and where critical components will be required.

Historically parts requests have entered an enterprise resource planning (ERP) system to raise a purchase order. A wait of up to six weeks then follows before delivery, meaning that a buffer stock is required. If, however, the volume of parts could be predicted before they fail, they could be ordered in advance ready for the order.

The new system is now being applied to a limited range of consumables that are replaced on a regular basis:

'Satair receives a live signal via electronic data interchange (EDI) whenever a part is taken from the operator's warehouse shelf for line maintenance or an evening layover. That information gives Satair greater visibility into the operator's inventory levels and use patterns, which should in turn allow Satair to manage those inventory levels more efficiently and potentially reduce the amount of inventory in stock.'

The present objective is to get 60 to 70 per cent of a fleet providing live data to enable it to be expanded for larger operators.

Boeing: Managing Airplane Health

The last case study is that of aircraft manufacturer Boeing, whose approach to 'Big Data' is one of analysing the relevancy of data as opposed to the volume. In their 'wellness programme for airplanes' around 3,000 on-board sensors monitor over 100,000 variables on aircraft in flight. These variables are then transmitted in the form of real-time data to Boeing ground staff, adding to data collected from pilots, flight crews, maintenance operations and inventory management systems.

A data centre is used to create an overall picture of each aircraft, which in turn allows Boeing to predict what is likely to happen to an aircraft so that parts can be made available in advance, or maintenance performed early to save on downtime later.

To illustrate the author uses the example of a temperature spike in an air conditioning system that occurred over several flights of an aircraft. An inspection led to the discovery of a foreign object in the ducts. Its removal prevented much more serious problems from arising in the future.

Future plans are to use such information to optimise maintenance schedules and realise design improvements.

In the UK Boeing is a major sponsor of The Integrated Vehicle Health Management Centre at Cranfield University, which was set up in 2008 to help the aviation industry develop applications for 'Big Data'. The Centre has defined Integrated Health Management as follows:

'A multi-sector discipline applied to a wide range of vehicles (aerospace, automotive, rail, marine, energy) that transforms systems data into information to support operational decisions on vehicle condition and hence provide business benefit derived from minimised maintenance action, improved availability and lower cost of ownership.'

The Centre is now working on ascertaining the right number of sensors and the right installation points so as to yet further improve measuring and monitoring.

BREAKTHROUGH IN SENSOR-BASED LOGISTICS

One of MRO Europe's chief sponsors was SenseAware® powered by FedEx, who are a key player in the field of aviation electronics.

SenseAware® provides near real-time access to shipment locations and environmental conditions such as temperature, humidity, exposure to light and barometric pressure, and the ability to collaborate and share that information with business partners.

The service integrates an advanced multi-sensor device that travels inside a shipment with a powerful web-based application that allows clients to stay in touch when contents are critical. Actionable near real-time data and customised alerts then provide notification should problems arise.

Accurate, easily accessible information regarding location and environmental conditions enable correction of operational issues and improvement of supply chain efficiency.

More information is available from www.senseaware.com

CASE STUDY: FEDEX EXPRESS AIRCRAFT ON GROUND

Every day the FedEx Express Aircraft on Ground (AOG) Team in Memphis, Tennessee, has the daunting task of ensuring the timely delivery of critical maintenance and repair parts for the world's largest express company's fleet. Whether it's a bolt that costs just a few dollars or a flight-control computer for a Boeing 777 worth over \$1 million, any significant delay in the receipt of these critical parts can translate into hundreds of thousands of dollars in lost revenue for every hour that the aircraft is out of service.

In addition any disruption to the repair of an out-of-service aircraft could mean missed delivery commitments and customer dissatisfaction, damaging the company's high reputation.

Historically the FedEx AOG Team relied chiefly on barcodes and hand-written log sheets to track valuable parts shipments, which resulted in largely static data that was cumbersome to analyse and led to large gaps in location information. This then led to an increase in recovery time for lost or misrouted parts – once a part left the warehouse the AOG Team had limited visibility of the shipment.

In 2012 SenseAware® powered by FedEx was introduced to actively monitor time-sensitive parts for the company's jet aircraft. The multi-sensor device was then used to collect and transmit data on each shipment's location in near real-time via wireless communication to a powerful online application for enhanced visibility and insight from origin to destination.

With this innovation the FedEx Express AOG operation achieved much enhanced visibility of aircraft out-of-service and maintenance shipments, whilst stakeholders at FedEx warehouse locations became able to access the web-based SenseAware® interface to monitor the location and arrival of shipments. This collaborative feature reduced the number of calls to the AOG Team and enables all participants to respond to a delay hours earlier, mitigating the operational impact of misrouted parts.

As an example, the AOG Team used SenseAware® location data to discover that a critical part destined for a grounded aircraft in Indianapolis had inadvertently been directed to another FedEx facility. Instead of having to wait until the package passed through the sort process, a Supply Chain Logistics warehouse employee was able to rescue the shipment and carry it directly to the grounded aircraft saving a considerable amount of costly downtime.

Another benefit has been the provision of proactive location information that allows the AOG Team to plan and prepare more effectively at the job site as well as resolve issues and delays before they have a negative impact on operations.

With SenseAware® the AOG Team has acquired a powerful cost-effective shipment monitoring solution without the need for further investment in infrastructure, and a noticeable improvement in reaction time to address misrouted or lost parts through enhanced communication has been reported.

ELECTRONIC FLIGHT BAGS CASE STUDY: FLIGHTWORKS

Many aircraft operators are now using Electronic Flight Bags (EFBs) in order to save money and streamline updates to their flight manuals. Instead of providing paper copies of manuals and operations procedural documents, the digital copies can be stored on tablets and updated with ease.

Global carriers such as United Airlines have estimated that the use of mobile devices in cockpits can produce annual fuel consumption savings of up to 326,000 gallons through the elimination of the excess weight required for pages of printed manuals. Also, with real-time connectivity, pilots can optimise flight plans, taking into account weather conditions, flight paths and runway conditions.

In the US The Federal Aviation Administration (FAA) has approved tablet EFBs but only under strict supervision so as to ensure passenger safety and ensure that sensitive data does not fall into the wrong hands.

In order to help aviation firms to achieve the benefits within FAA regulations a mobile device platform has been developed known as AirWatch® and one operator that has implemented the system is FlightWorks, the largest provider of air charter, aircraft management, government services and aviation consulting in Southeast USA.

Historically FlightWorks had an 'in-house printing shop' that was responsible for keeping flight manuals up-to-date with current flight information and charts used for navigation. Their Vice President of Business and Information Systems, Johan Segring, is quoted as follows:

“Our pilots had been asking for a tablet solution. We needed a mechanism to distribute both critical and proprietary manuals required to be on-board the aircraft but with enhanced security features given the nature of the data. The print method was inefficient to say the least. At any given time, any flight can be line checked by an FAA inspector who will ensure you are carrying the proper version of a host of manuals that are subject for monthly revision. With the tablet everything is done instantly. That improves efficiency and it's ultimately more accurate.”

In order to ensure FAA compliance while delivering data securely to pilots, FlightWorks has implemented an AirWatch® exclusive content management system known as the Secure Content Locker (SCL). Downloaded to the device as a mobile application, the SCL is a data repository where sensitive data can be housed in a secure environment for mobile access anywhere in the world. Once installed, pilots are required to enter their login credentials through a directory-based authentication layer. Should unwarranted access be attempted or even achieved, the SCL can remotely disable access or even delete downloaded documents by the administrator.

Mr. Segring states:

“The Secure Content Locker enables our flight Operations Management Team to distribute manuals and revisions with a few clicks and monitor compliance, regardless of where in the world the aircraft happens to be at the time of release. We demonstrated the SCL system and process to our FAA Principal Operations Inspector, who was extremely impressed. This demonstration was actually how we got him to sign-off on starting our initial six month proof of concept period without hesitation.”

Assistant Chief Pilot, Chad Noblit, added:

“It’s absolutely huge to have these devices in the cockpit. The tablets save space by eliminating printed charts and manuals which gives us more room to play with weight on the aircraft. We’ve been able to shed about 60 pounds per aircraft by replacing the printed charts and manuals with the tablets. The ease of access to the information and the availability at a glance – you can’t put a price on that.”

Further information

For further information on this subject visit info@air-watch.com

DATABASE TECHNOLOGY IMPROVES COCKPIT RADIO MANAGEMENT

A new VHF Nav/Comm Radio, the Garmin GNC®255 series, is revolutionising cockpit radio management. Instead of searching through multiple charts and airport directories to find the nav and comm. Frequencies needed for a flight, the GNC®255 provides a ‘frequency lookup function’ whereby only the navaid or airport identifier need be entered to find the frequency or frequencies associated with a particular location. Conversely, the lookup function can also provide the station identifier for a frequency provided by air traffic control.

Garmin state:

‘With an airport ID you can use the database to look up the frequencies for Tower, Ground, ATIS, Clearance Delivery and so on – a great convenience to have when you’re operating in busy controlled airspace. Other handy GNC255 features include automatic decoding of the Morse Code station identifier for VOR/LOC/ILS; “flip-flop” standby – into active frequency selection; built-in course deviation indicator; internal two-place intercom and storage/recall for up to 15 most often used frequencies. In addition, the unit will automatically store the last 20 frequencies called, and standby comm. Frequency monitoring enables you to listen to ATIS or other transmissions without leaving the active frequency.’

On the nav side the unit’s database-generated ‘nearest’ function simplifies location and identification of airports, weather stations, VORs, ATC facilities and Flight Service Stations in closest proximity to the flight route.

The GTR®255 is TSO certified and available in versions offering 10 or 16 Watts of transmitter power output. Both give access to all VHF comm., VOR, glidescope and localiser frequencies with pilot-selectable 25 or 8.33 kHz voice channel spacing to support the 8.33 comm mandate in Europe and provide 'good-to-go' capability worldwide.

Further information

Further information on this subject may be obtained from Garmin (Europe) Limited, Liberty House, Hounslow Business Park, Southamton SO40 9RB. Telephone: 01794 519 944.

ADVANCES IN SENSOR TECHNOLOGY IMPROVE INFRASTRUCTURE AIRBORNE INSPECTION

Supplies of electricity and gas are usually taken for granted by the general public, but keeping them flowing is a critical necessity for utility companies.

Until recently data collection rates for airborne laser radar (LIDAR) payloads, for example, limited speeds on inspection flights to around 30 kt, but advances in sensor technology are starting to deliver much higher capabilities, creating a double-edged sword for helicopter operators. On the one hand they can fly faster along the straighter portions of a right of way without compromising on the quality of images collected, but on the other the new developments offer opportunities for fixed wing operators that previously would have been impractical.

Of growing importance are UV cameras that detect corona around conductors and insulators in high-voltage power lines. Corona forms when electricity ionises air molecules so as to create conductive paths that allow energy to leak from the transmission system. Discharges commonly occur on projections, sharp objects, metal edges and thin wires that can indicate the presence of broken cables. The presence of corona is mostly revealed in the UV part of the spectrum due to the emission of ultraviolet light caused by electrons re-uniting with ionised atoms and releasing photons. Sensor turrets with corona imaging capabilities, such as the FLIR Systems Polytech Corona 350 III multi-sensor turret, are therefore proving useful. The sensitive radiometric IR camera on this unit can also detect hot components at long ranges and data from the camera can be transferred to an on-board PC for post-flight processing with FLIR Systems' Reporter Professional Software.

For solar-blind UV applications Ofil have developed a camera that works in the 240-280 nm band, a wavelength at which the Earth's atmosphere absorbs solar-generated UV. This is said to enable 'absolute detection of weak UV signals in full daylight with high signal-to-background ratio and only negligible background noise.'

Some faults can generate high temperatures without producing corona effects, whilst some corona effects are not necessarily linked to heat. This gives rise to an infra-red (IR) application for cases when lines are conducting a heavy electrical load. As

corona is voltage-dependent no line loading is needed. The result is that there is a case for an ideal mix of sensors that can provide high quality, real-time information on external and internal defects in electrical transmission systems. To this end Ofil provide the DayCor ROM System that integrates the RomPact 300i bi-spectral solar-blind UV camera, a 36x zoom HD TV camera, a VarioCam HD radiometric IR camera and an HD stills camera.

Not all faults are linked to electromagnetic emissions. Physical interference from trees, for example, is a major problem for power companies, and for this active sensors that produce 3D geo-referenced and time-stamped imagery are required. These are LIDAR sensors and work by transmitting laser pulses and receiving reflections from 'targets' in their path, deriving range from the time that elapses between transmission of the pulse and receipt of the echo. The data from which 3D images are built comes from the range and return signal intensity measurements correlated with position and attitude measurements a GPS/GNSS/INS. A LIDAR equipped helicopter can typically survey around 160km of right of way in a day.

For these applications Trimble have developed the Harrier 68i, which integrates the wide-angle LMS-Q680i laser scanner and an 80 Mpx aerial camera with the company's Applanix POSTrack direct geo-referencing and flight management system. A class 3R eyesafe laser scanner is used and its high pulse and scanning rates enable it to generate 'extremely dense point clouds'.

With a field of view of up to 60 degrees it can operate at altitudes from 100 to 5,000 feet and produce a swath width of up to 83 per cent of the operating altitude. Trimble quote a range resolution of 2cm, vertical accuracy of 15cm and horizontal accuracy of 25cm, although this can vary according to flight altitude, speed, collection method and post-processing.

The integral medium-format digital frame camera takes orthogonal images, defined as such by their correction for terrain relief, lens distortion and camera tilt. The camera is also radiometrically calibrated to remove distortions of colour and brightness caused by the light's passage through the atmosphere and peculiarities of the sensor's response.

For gas pipelines the Airborne Laser Methane Assessment (ALMA) from Pergam Technical Services measures the proportion of laser light absorbed by methane, which makes up over 90 per cent of natural gas. The pulsed-diode laser emits at a wavelength of 1.65 μ m, the first absorption band of methane. Aiming the laser downwind of the pipeline, the ALMA optical unit collects reflections in a parabolic mirror and passes them through a detector for comparison with a reference channel containing a standardised methane sample. When methane is present the laser light will be absorbed and the deformation of the signal will be proportional to the concentration of methane along the laser beam path.

This system comprises a 45kg optical unit that contains the laser, photo detectors, mirrors and digital camera that automatically photographs targets when methane levels exceed a given threshold. A 25kg 'D-Box' contains the power distribution equipment, video recorder and electronics. The remaining components are a laptop control system and a monitor that helps the pilot fly the pipeline.

Further information

The information contained in this article is from 'Right down the Line' by Peter Donaldson in the August/September issue (Vol. 7, No.4) of the helicopter journal *Rotorhub*, by publishers Shepherd. For details telephone: 01858 438 879.

MATRIX TECHNOLOGY IMPROVES FLIGHT SAFETY

At Helitech Sikorsky Aircraft were promoting their Matrix Technology research programme that has been launched this year to develop systems and software designed to improve flight safety for all vertical take-off and landing (VTOL) aircraft.

Matrix Technology aims to provide both rotary and fixed wing VTOL aircraft a level of system intelligence that will allow them to complete complex missions with minimal human oversight even at low level.

Two of the centrepieces of the programme are a fly-by-wire S-76 test bed known as Sikorsky Autonomous Research Aircraft (SARA) and a UH-60M Black Hawk demonstrator. The S-76 is dedicated to the rapid flight-testing of software and hardware, including multi-spectral sensors, that were previously restricted to the systems integration laboratories at Sikorsky's Connecticut headquarters. When not in flight the aircraft can be configured as its own simulator to develop and test autonomy software and hardware. The UH-60M will form part of a cargo logistics demonstration as part of a cooperative R and D agreement with the US Army.

A major objective of the programme is to transform the loss rate for unmanned aircraft, which currently averages one per 1,000 hours to one per 100,000.

Mark Miller, Vice President of Research and Engineering for Sikorsky, is quoted as follows:

“VTOL pilots increasingly will become mission managers (and) will feel comfortable letting the aircraft fly itself. Matrix will provide order-of-magnitude improvements in system intelligence to ensure high levels of reliability, and ultimately make unmanned missions by helicopters and VTOL aircraft of all sizes (more) affordable. Robust architecture, multi-level contingency management and advanced system intelligence algorithms will enable this transformation.”

Further information

More information about Sikorsky's Matrix Technology programme may be obtained in *Rotor and Wing* Helitech Special (September 24, 2013), ref. 'Sikorsky highlights S-76 SARA Tech Demonstrator' by Andrew Healey, and *Rotor and Wing* journal (September 2013), ref. 'Sikorsky's Matrix Technology seeks to execute Missions within a Virtual View of the World' by Andrew Parker. Also www.sikorsky.com

ECOC 2013

ECOC is the largest conference on optical communication in Europe and one of the most respected and long-standing events of its kind in the world. Each year it moves around Europe, but this year it returned to London, where the first ECOC conference was held in 1975. In Amsterdam in 2012 it attracted around 1,100 delegates, 329 exhibitors and 4,483 visitors. The conference was organised by The Institution of Engineering and Technology, whilst the exhibition was organised by Nexus Media Events. Between them they provided a wealth of information for electronics professionals that is too vast to report here. Below, however, is an overview of some of the highlights.

MODE GAP PROVIDES SOLUTION TO CAPACITY CRUNCH IN TELECOMMS NETWORKS

MODE GAP, the European collaborative R and D project that forms part of the European Commission's 7th Framework Programme that is providing Europe with a lead in the development of next generation telecommunication, used ECOC to present its latest results.

The project researches next generation transmission targeted at combating the potential capacity crunch using Spatial Division Multiplexing (SDM), for which there are two options:

- (a) Multi-core fibres
- (b) Multi-mode fibres

MODE GAP is focusing on the multi-mode approach with research into basic fibre and components development through to subsystems and full system validation.

In addition to explaining SDM over few mode solid core silica fibre, MODE GAP has already achieved record transmission results over Hollow Core-PBGF fibres for transmission and in the 2,000 nm region, offering increased bandwidth opportunities.

Dr. Ian Giles, Project Manager for MODE GAP commented:

“The research carried out by the project over the past three years has helped progress the field and increase our understanding of the implications for using few mode fibres to assist in increasing transmission capacity. The work is continuing for another year and we anticipate further progress towards demonstrating the feasibility of a multi-mode fibre approach for future networks.”

MODE GAP is a key project seeking to provide Europe with a lead in the development of the next generation Internet infrastructure to address the potential capacity crunch as traffic on the world's optical networks continues to increase dramatically. By combining the expertise of world leading photonics partners, the

project is developing transmission technologies based on specialist long-haul transmission fibres and associated enabling technologies. These include novel rare-earth doped optical amplifiers, transmitter and receiver components and data processing techniques to increase the capacity of broadband networks.

Further information

For further information visit <http://modegap.eu/>.

ADVANCES IN DELAY-LINE INTERFEROMETER TECHNOLOGY

One of the leading organisations comprising MODE GAP is The University of Aston in Birmingham's Institute of Photonic Technologies and scientists there have developed an in-fibre delay-line interferometer that uses a Fibre Bragg Grating in transmission.

Delay-line interferometers, such as Mach-Zehnder or Michelson Interferometers, constitute a major optical block in many optical systems for diverse areas of application such as optical communications, metrology and sensing, and perform temporal interference of time-delayed replicas of an input optical signal. Such interferometers are required for optical differential phase-shift keying (DPSK). The increase in orthogonal frequency-division multiplexing (OFDM) applications has recently given rise to a growing market for such devices.

It is well known that delay-line interferometers can be implemented with two arms of optical fibre and fibre couplers, but the polarisation state of light may change during propagation in the fibre, and temperature changes in the fibres (as well as bending) can affect the optical phase shifts.

At Aston scientists have developed an in-fibre delay-line interferometer that enables the implementation of the device in a single optical fibre section, implemented in a transmissive phase-modulated Fibre Bragg Grating. A Fibre Bragg Grating in transmission works without an optical circulator and does not require any additional device to extract the output. The desired functionality is obtained by minimum phase linear filtering rather than optical signal interference, resulting in a high polarisation and temperature robustness, and an accurate and robust free spectral range.

The Aston approach shows robustness against grating fabrication errors and is highly reproducible because the Fibre Bragg Grating coupling strength remains constant along most of the grating length, and the phase-modulation profile obtained can be directly encoded in a phase mask. In addition, higher order delay-line interferometers can also be obtained in a single device.

The design can be modified for differing wavelengths using a numerical optimisation technique to calculate the precise nature of the grating. Sample devices with a 9cm

Fibre Bragg Grating, 3nm bandwidth and 50 GHz free spectral range have now been produced.

Key advantages of the device are stated as follows:

- Simple low cost implementation in a single optical fibre section.
- In-fibre compatibility with low insertion losses.
- Robustness to temperature and polarisation.
- Minimum-phase linear filtering resulting in no physical interference in the interferometer functionality.
- Accurate and robust free spectral range.
- High-order delay-line interferometers can be implemented in a single device
- High fabrication reproducibility.

The current status of the device is that a patent has been filed and licensing partners are now being sought.

Further information

The Aston Institute of Photonic Technologies is one of the largest photonics research groups in the UK. It has a world-recognised record of achievement in non-linear photonics, high-speed optical transmission and processing, in-fibre optic components and in-fibre optic sensors.

For further information contact Dr. Sarah Bond, at The Aston University Business Partnership Unit on 0121 204 5029. Email: t-bond@aston.ac.uk

FIRST COMPLIANCE TEST AND DEBUG SOLUTION FOR QSFP+

Tektronix Inc., the world's leading manufacturer of oscilloscopes, have launched the first compliance test and debug solution for Quad Small Form-factor Pluggable (QSFP+) compatible products.

Based on Tektronix DPO/DSA/MSO70000 oscilloscopes the new QSFP+ solution includes all the necessary components to design, test and validate QSFP+ designs including HCB fixtures and test automation and debug software tools.

QSFP+ is a compact, hot-pluggable transceiver used for data communications applications. It interfaces a network device motherboard, such as for a switch, router, media converter or similar device, to a fibre-optic cable. The latest specification,

published by the SFF Committee, enables data rates of 4x10 Gb/s with support for Serial Attached SCSI, 40G Ethernet, 20G/40G Infiniband, and other communications standards. QSFP+ modules increase port density by three to four times relative to SFP+ modules.

Unlike other SFP+ test solutions that are based on sampling oscilloscopes, the new Tektronix SFP+QSFP+Tx solution is based on real-time oscilloscopes, the preferred test platform for engineers designing products for QSFP+ as well as for such standards as SFF-8431 and SFF-8635. The SFP+QSFP+Tx solution is also the only offering with integrated support for Transmitter Waveform Distortion Penalty for Copper (TWDPC) testing as called for by the SFF-8431 standard.

The SFP+QSFP+Tx solution boosts productivity with simple menu-driven setup and one-click compliance testing coupled with automated pass/fail report generation. Design characterisation is supported beyond the standard compliance requirements, with flexible control over test configurations such as analysis windows and other parameters. If designs fail compliance testing users can take advantage of DPOJET (Jitter and Timing Analysis) setup files to reduce debug time.

Brian Reich, General Manager for Performance Oscilloscopes at Tektronix states:

“Standards such as QSFP+ and SFP+ are constantly changing and evolving which means that engineers need comprehensive test solutions in order to efficiently and quickly validate their designs and bring them to market. Our solution offers automated compliance testing that can save customers up to 80 per cent in test time compared to manual testing while also providing a seamless transition to our world-class debugging environment.”

Further information

For more than 65 years engineers have turned to Tektronix for test, measurement and monitoring solutions to solve design challenges, improve productivity and dramatically reduce time to market. Tektronix is a leading supplier of test equipment for engineers focused on electronic design, manufacturing and advanced technological development. Tektronix has its headquarters in Beaverton, Oregon, USA.

Further information may be obtained from Tektronix UK, Western Peninsula, Western Road, Bracknell, Berkshire RG12 1RF. Telephone: 01344 392 423. Email: petra.quaedvlieg@tektronix.com. Website: www.tek.com/application/optical-communications.

REAL-TIME OSCILLOSCOPES ACHIEVE 70GHz PERFORMANCE

Another innovation from Tektronix is next generation oscilloscopes with breakthrough low-noise architecture for high speed, high precision test applications that are able to deliver a real-time bandwidth of 70GHz.

The new oscilloscope platform will deliver the performance and signal fidelity needed for applications such as 400 Gbps and 1 Tbps optical communications and fourth generation serial data communications.

The extraordinary gain in bandwidth performance, with improved signal fidelity, is due in part to the development by Tektronix engineers of a patent pending signal processing architecture known as Asynchronous Time Interleaving. The limitation of frequency interleaving lies in how the various frequency ranges are added together to reconstruct the final waveform, a step which compromises noise performance. In traditional frequency interleaving each analogue-to-digital converter in the signal acquisition system only sees part of the input spectrum. With Asynchronous Time Interleaving, however, all analogue-to-digital converters see the full spectrum with full signal path symmetry. This offers the performance gains available from interleaved architectures whilst at the same time preserving signal fidelity.

Commenting on the new development, Kevin Ilcisin, Chief Technology Officer for Tektronix said:

“With these latest innovations, Tektronix is continuing to push the envelope on what can be achieved in high-fidelity, high-speed data acquisition systems. The development of the industry’s first production-ready Asynchronous Time Interleaving architecture is a significant breakthrough that will improve signal-to-noise ratio beyond the frequency interleaving approach used by competing oscilloscope vendors.”

Contact: as above.

NEW PROACTIVE PASSIVE OPTICAL NETWORK MANAGEMENT SYSTEM

UTEL, Europe’s leading independent research and development company for telecommunications systems, launched a new complete fibre network management system based on its ground-breaking Fast Light technology at ECOC 2013.

Fast Light is a central office OTDR fibre test system that can reliably detect ONT reflections through 128 split PONs without expensive wavelength dependent reflectors. This measurement capability is possible through UTEL’s revolutionary Advanced Reflection Detection (ARD) technology that is setting a new global benchmark for OTDR performance.

The UTEL Fast Light PON management system consists of three key subsystems including a unique world-class 1650nm OTDR that can see through multiple cascaded splitters, an ultra low cost Robotic Optical Test Access Switch that can be flexibly expanded as the network grows, and an optional Operational Support System or Application Programming Interface.

In service the Fast Light PON management system offers the capability to eliminate the conventional manual fault finding processes along with the skilled technicians, truck roles and costly hand-held OTDRs otherwise needed to fault PONs.

Commenting on the launch Frank Kaufhold, Managing Director of UTEL, stated:

“We have had the technology to change fibre business models in place for more than a year, but now realise that what service providers are looking for is a complete solution. We have now finished and what we have is something more advanced than anything else on the market. It can find faults before customers detect them and makes sure the entire network is running at optimal levels with fewer expert engineers.

Passive Optical Networks are not just another transitional broadband technology like UDSL, but are the foundation for a new telecommunication world order. Getting it right is essential. The early incorporation of automated fibre integrity monitoring systems will not only provide dramatic savings during fibre network roll-out but will enable operators to meet customer repair process expectations at minimal cost.”

Further Information

UTEL is Europe’s leading independent research and development company for telecommunications systems. Copper and fibre test access switch and testing solutions have been strong areas for UTEL, with the company creating world-first remote fault detection technologies. The company has expanded in recent years and now has a turnover of over 20 million Euros and over 40 employees at its sites across Europe. It has achieved this growth through the sale of highly innovative solutions to companies ranging in scale and sector from the largest telecomms service providers in the world to smaller niche clients with specific project needs.

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FRAUNHOFER HEINRICH HERTZ INSTITUTE INTRODUCES WORLD’S FASTEST ARBITRARY WAVEFORM GENERATOR

For the development of tomorrow’s high speed communication networks, The Fraunhofer Heinrich Hertz Institute has introduced the world’s fastest Arbitrary Waveform Generator (AWG) with a speed of no less than 70 Gsa/s (70 billion samples per second).

With this new AWG novel modulation formats can be tested and analysed in realistic applications without any need for costly and time-consuming experimental setups.

The AWG generates arbitrary signal shapes and signal strings at speeds of up to 70 Gsa/s. This high sampling frequency is enabled by two 35 Gsa/s digital-to-analogue converters with the highest bandwidth currently on the market developed by Fraunhofer HHI's partner Micram Microelectronics GmbH. With time interleaving the sampling rate can be doubled to 70 Gsa/s, and for the generation of complex signals a synchronised setup of multiple linked 70 Gsa/s AWGs can be used.

The 70 Gsa/s AWG setup also allows for use of the traditional two-channel mode in which two independent signals each of 35 Gsa/s can be output simultaneously.

The results produced by the 70 Gsa/s AWG are an invaluable aid to the development of next generation communications systems and components such as optical transmission technology for data centres and mobile telephony. They are also of interest to the development departments of companies and universities engaged in the fields of optical transmission technologies, wireless technology and measurement technology.

Further Information

The Fraunhofer Heinrich Hertz Institute is a world leader in the development of mobile and fixed broadband communication networks and multimedia systems. From photonic components and systems to fibre-optic sensors and high-speed hardware architectures, The Fraunhofer Heinrich Hertz Institute works together with its international partners from research and industry on building the infrastructure for the future Gigabit society.

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BREAKTHROUGH IN 100G PARALLEL CDR TECHNOLOGY

TeraSquare Inc. of Korea, one of the leading companies in fables semiconductor development, used ECOC to unveil a unique parallel Clock Data Recovery (CDR) solution that dramatically improves signal quality across 100G systems and realises considerable power consumption savings.

The parallel CDR-TS-CM44013 slashes Integrated Chip power consumption to 0.75W compared to average CFP4 levels of 3.5W, does not require a clock reference and has built-in JTOL testability, which avoids the present expensive requirement for external testing equipment.

The 100 Gb/s parallel CDR has 25.0-28.3 Gb/s per lane in an 8mmx8mm sdtandard BGA package for CFP4/QSFP28 modules and supports CEI-28G-VSR specifications.

The Integrated Chip, in addition to its low power consumption, also features a reference-less mode and jitter filtering operation with no external filter capacitor required, and includes on-chip testabilities including JTOL and PRBS generator.

Further Information

TeraSquare Inc. was founded in December 2010 and has particular expertise in the field of BER-aware architectures. This drives multiple platforms including 100-giga bit Ethernet solutions with various distance (0-80 km, SR, LR/ER and ZR) and 10-giga bit EDC solutions for 10G PON, LTE backhaul, and 10-giga bit Ethernet markets.

TeraSquare's Chief Technical Officer, Dr. Jinho Park, was previously Senior Design Manager at Marvell in Silicon Valley where he led a research and development group of 30 PhD developers that led to the analog and RF design of the world's first 802.11ac mobile MIMO Integrated Chip.

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