Case Study

Digital Terrestrial Television in Denmark

Background
Before digitalisation, Denmark’s two analogue channels transmitted from separate stations using their own antennas, with DR 1 on the VHF waveband and TV 2 on UHF. When Denmark started to move towards digital TV, the two TV channels formed a joint company in 2004 to build and operate the network – Broadcast Service Denmark A/S (BSD).

BSD is replacing the two separate networks with a single nationwide network, which will bring economic benefits to both broadcasters. From 1 April 2006 over 99% of the population will be able to access digital TV, and the analogue network will be finally switched off in 2009.

Challenge
Until 2009, analogue and digital television must be transmitted in parallel, with minimal disruption to the existing analogue transmissions. Willy Tang, Project Manager at BSD, explains that it has been a challenge to make optimal use of the existing infrastructure. “This applies both during the transitional period of parallel transmission, and also once the analogue system is switched off so that we can use the available input.”

Solution
When trials of digital transmissions on one channel began in 2002, the TV 2 stations were used. BSD has chosen to continue using the TV 2 stations, where a new multiplex was installed for the parallel analogue and digital signals. A digital filter was put in place that combined the analogue and digital transmitter to the same antenna. Four TV programmes are transmitted over this digital channel.

Willy Tang describes the technical setup. “A six-cavity waveguide filter is placed directly after the first digital transmitter to make the bandpass for the transmitter. Output for this filter goes to the wide input at a three-cavity
waveguide combiner for analogue TV2. The next stage in the chain is a power splitter that divides the signal to the upper and lower halves of the antenna."

"When the next multiplex is installed, a new combiner will be inserted between the bandpass filter and the combiner to the analogue transmitter. The system will be big enough to accommodate four digital multiplexes."

The simplicity of the system minimises disruption to the analogue transmissions during installation. Today the 17 main stations transmit with an effect ranging between 600 W and 6 kW rms. Twenty gap fillers are needed in order to attain 99% coverage. While all the digital television transmitters are at the TV 2 stations, the DR 1 stations continue to transmit the analogue DR1 channel and radio, and host mobile telephone transmitters.

In preparation for the Regional Radiocommunication Conference in Switzerland this year, Denmark has applied for a total of 8 multiplexers, four of which will be available when analogue television is switched off. Frequencies allocated so far have required adjustments to the power at some stations.

Exir Broadcasting & Telecom has assisted BSD with the installation and final measurements of the system. Throughout the project the companies have worked together on specifications and needs, and Exir Broadcasting & Telecom has assisted with system design when BSD has ordered combiners.

Willy Tang is pleased with the collaboration. "Working with BSD personnel, Teracom has replaced existing combiners where more than two transmitters were needed. Teracom has also changed the existing combiners to the channel used by the DVBT transmitter. At the stations where we have used the existing combiner, this will be replaced when the next multiplex is installed. Teracom has handled all the calculations and has also helped us find the best individual solutions."

“When the next multiplex is installed, a new combiner will be inserted between the bandpass filter and the combiner to the analogue transmitter. The system will be big enough to accommodate four digital multiplexes.”

Willy Tang