# DVB-T software radio transmitter eXtension for IRIS (DVB-TX-IRIS)

Name of organisation:
Department of Engineering, University of Perugia (UPG)

Goal of Extension:
The DVB-TX-IRIS Extension enables DVB-T compliant TV broadcasting to be carried out using off-the-shelf hardware and software, such as a regular CPU, Ubuntu OS, the Iris SDR framework, and an Ettus SDR device. The high level of reprogrammability permits to keep broadcasting transmitters up to date with future standards, without requiring hardware upgrades in the transmission network.

Main challenge of Extension:
The main challenge has been to generate a DVB-T compliant signal, and to transmit it without interruption at a high sample rate. Another challenge has been the modular design of the transmitter architecture, suitable for a parallelizable software platform. Finally, the designed transmitter has been incorporated into the WiSHFUL framework, which now includes a broadcasting standard.
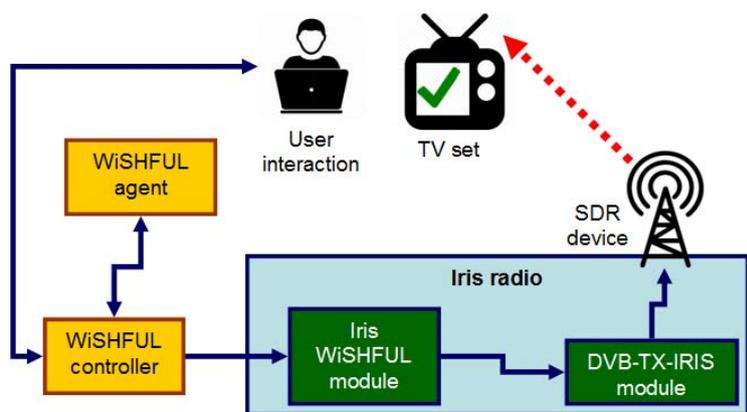
Description of setup of Extension:
The DVB-TX-IRIS module developed by UPG is an Extension of the WiSHFUL Iris SDR framework. The Extension streams data to an SDR device, from which the signal can be successfully received and decoded by off-the-shelf DVB-T receivers, such as TV sets, set-top boxes, and USB dongles. The Iris radio DVB-T module can be controlled either by means of XML configuration files, or by means of the WiSHFUL framework thanks to the WiSHFUL UPIs.
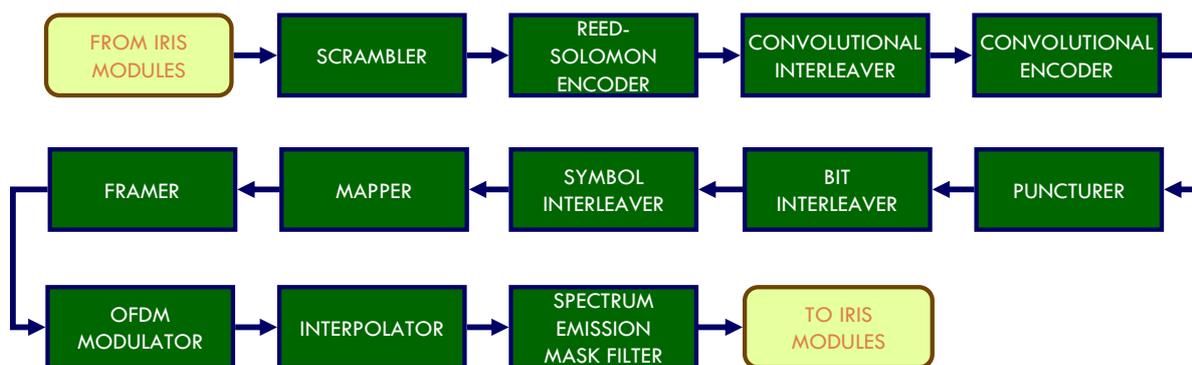
The implemented DVB-TX-IRIS module is constituted by a group of Iris components that are mapped to the founding sub-blocks of the DVB-T standard transmission chain. Each sub-block is instantiated inside a separate Iris engine, so as to achieve maximum parallelism and maximum possible processing speed.

Main results:

DVB-TX-IRIS can run in real-time on a laptop computer (Intel Core i7 @ 2.4 GHz CPU, 4 core/8 threads, 8GB RAM). The SDR transmitter CPU load is of nearly 25%, with about 100 MB of used RAM.
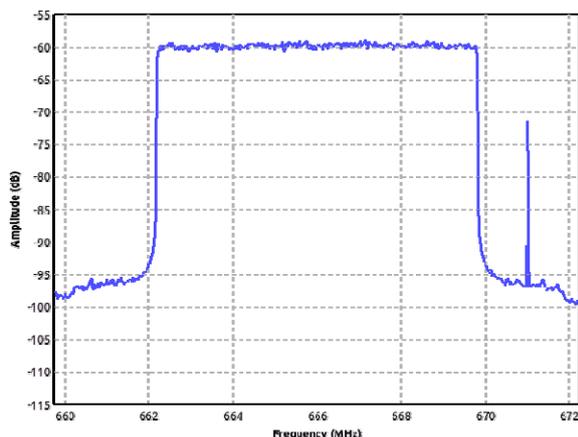
Real-time broadcasting of DVB-T standard compliant signal using Iris: note that the useful portion of the signal spectrum is clean and flat.

TV set reception of the DVB-TX-IRIS generated signal, using the typical parameters configuration (64-QAM, FEC 3/4, 8K 1/4): this allows delivering a payload of 22 Mbit/s, which permits to multiplex three full HD TV programs.

Conclusions:

DVB-TX-IRIS provides DVB-T compliant transmission functionality to the Iris SDR framework, which can happen in real-time with a typical CPU load of 25% on a modern quad core machine. Some of the parameters of the transmitter can also be remotely controlled with the WiSHFUL UPI framework. The transmitter can also run inside of a virtualized system, such as that provided by the Iris TCD testbed.

Feedback:

WiSHFUL has provided us with innovative software for developing and controlling real-time DVB-T compliant SDR TV broadcasting, and with suitable experimentation hardware, such as the Iris SDR testbed at Trinity College, Dublin. Writing the code for extending the SDR framework has been easy and flawless, and we appreciate the interaction among the tools offered by the WiSHFUL Consortium.