# AixSoLve *DirectSynthesesRef*

The AixSolve *DirectSynthesesRef* is a reference design based on an Altera Stratix4GX FPGA and an Analog Devices high speed DAC. In conjunction with AixSolve *DigitalSynthesesMegafunction* and e.g. AixSolve *QamMegafunction*, it is possible to upconvert directly from IQ to the final carrier band whereby all modulators are independent in carrier frequency and symbol rate.

AixSolve *DirectSynthesesRef* focus is not only on the cable and terrestrial TV modulation procedures but also on similar cases used for data communication.
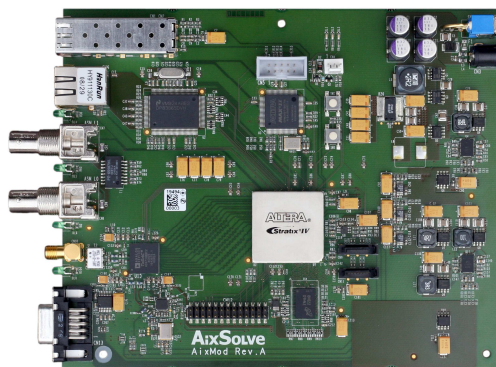
Required resources:
Based on Stratix IV, Arria2GX similar, actual synthesis might vary, project depended
(8x QAM + 8x Upcon + CPU + ASI + etc -> 55% usage for Stratix IV 110)

Altera	Combined ALUTs	Memory ALUTs	ALM	Dedicated Logic Registers	M9K	DSP
1x QAM+ RRC+HBF	1179	92	1012	1260	14	0
1x UpConverter	3346	68	3806	5793	40	104
1x Total	**4525**	**160**	**4818**	**7053**	**54**	**104**
8x QAM+ RRC+HBF	5505	400	5406	6895	117	0
8x UpConverter	20801	1737	23110	36387	96	356
8x Total	**26306**	**2132**	**28516**	**43282**	**213**	**356**
16x QAM+ RRC+HBF	10348	776	10452	13191	229	0
16x UpConverter	41055	3376	45634	71619	192	682
16x Total	**51403**	**4152**	**56086**	**84810**	**421**	**682**
*16x QAM+ RRC+HBF	10348	776	10448	13191	229	0
*16x UpConverter	40453	3376	42115	66975	192	548
***16x Total**	**50796**	**4152**	**52563**	**80166**	**421**	**548**

*16 Channel with slightly reduced output filters

FPGA	• Altera Stratix 4 GX 230
DAC	• Analog Devices AD 9739
Power Consumption	• < 20W (e.g. QAM 1.5W / channel @16 channels)
External Interfaces	• 2 ASI @ BNC 75 Ohm • SFP • Ethernet (802.3) 1000/100/10 MBit • RF out • RS-232
Internal Interfaces	• 2 * High speed SERDES transceiver ports • JTAG FPGA • GPIO Interface

Modulation schemes	• Any IQ based modulation
	• Possible implementations:
	    o DVB-C (8,12,16 channels)
	    o DVB-C2
	    o DVB-T
	    o DVB-T2
	    o FM
	    o PAL

Key facts	• Direct Up Conversion into the CAT-TV typical range of 50…900 MHz • Higher carrier frequencies possible by using 2nd/3rd Nyquist zones • Modulators are independent regarding carrier frequency and symbol rate • All IQ based modulation schemes could be supported • All-in-one platform - behaviour is in FPGA and not in analog components - e.g. DVB-T and DVB-C has no hardware differences
e.g. as QAM	• Up to 16 QAM channels in broadcast quality • Modulators are independent regarding carrier frequency and symbol rate • Example (QAM 64): MER > 46 • Example (QAM 64): SNR > 60

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