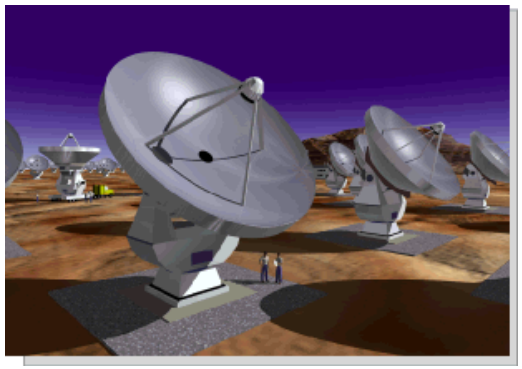


Atacama
Large
Millimeter
Array

Back End Subsystem (including Correlator)

R. Kurz

ESO-Wide Review
13-17 February 2003

ALMA Project

Back End IPT / Main Tasks

- Intermediate Frequency (IF) Processing
  - Down convert IF from front-end receivers
  - Digitization (Digitizer, Demux, Test Bench)
  - Sampler clock
  - IF Data Transmission System (Digital & Fiber Optic)
- Timing, Synchronization, LO Distribution
  - LO Reference including 2nd LO (1st LO in Front-ends)
  - Reference generator & distributor (10, 25, 125 MHz, 48 ms)
  - 2nd LO Synthesizer
- Photonic Local Oscillator (1st LO) Reference (100 GHz)
  - Laser synthesizer
  - Line length corrector
  - LO reference receiver

ALMA Project

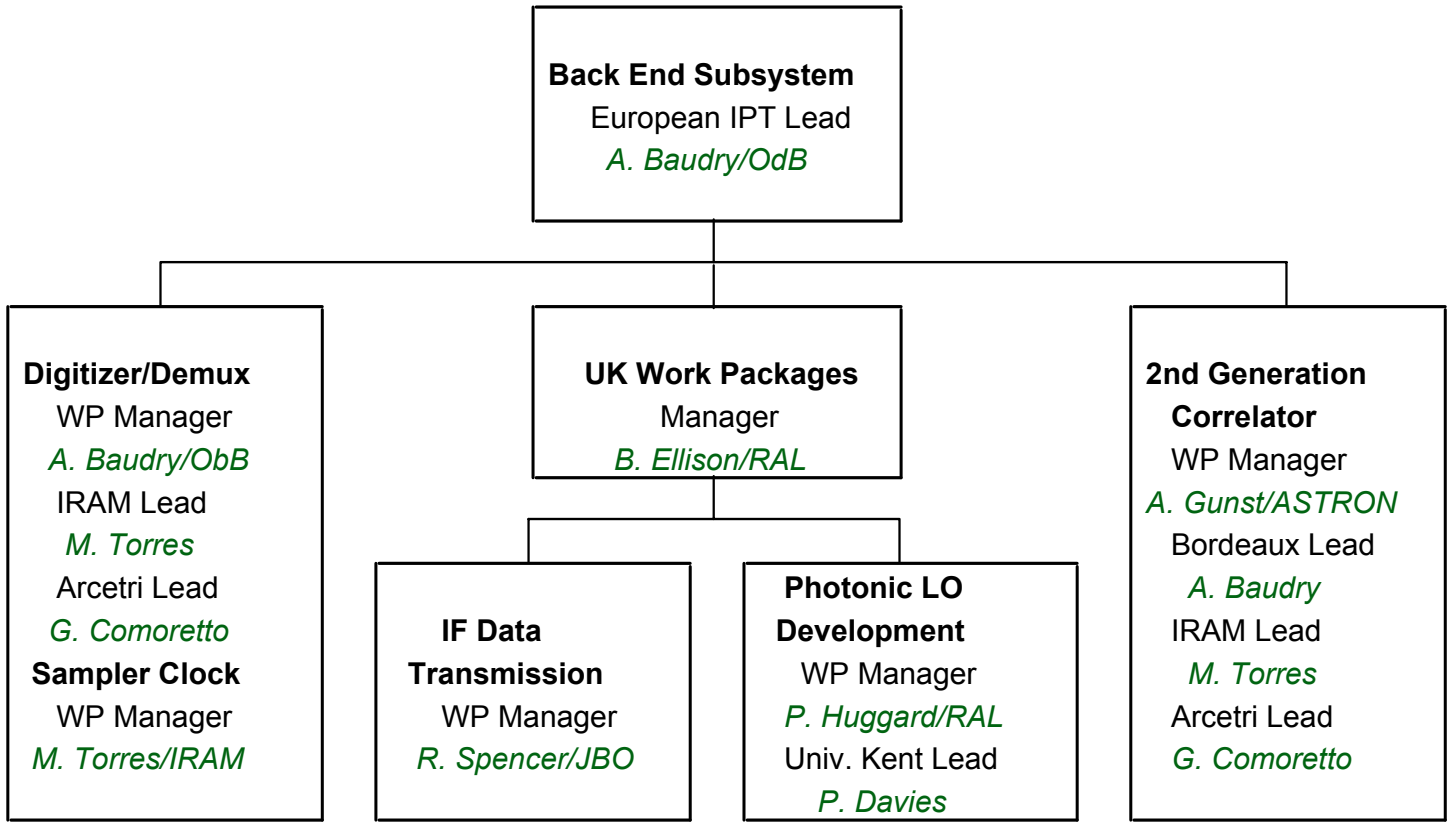
Backend IPT/Share of Tasks

• IFDC Prototype and Production	North America
• Digitizer Prototype and Production	Europe
• Sampler Clock Production	Europe
• IF Data Transmission System Prototype and Production	NA, Europe (FOX, FOR, WDM, Fiber)
• LO Prototype and Production	NA, Europe (H-maser, Photomixer, Optical Comb Generator - OCG)

- Integration support will follow the above NA/Europe scheme

ALMA Project

European Back End Team Organization



ALMA Project

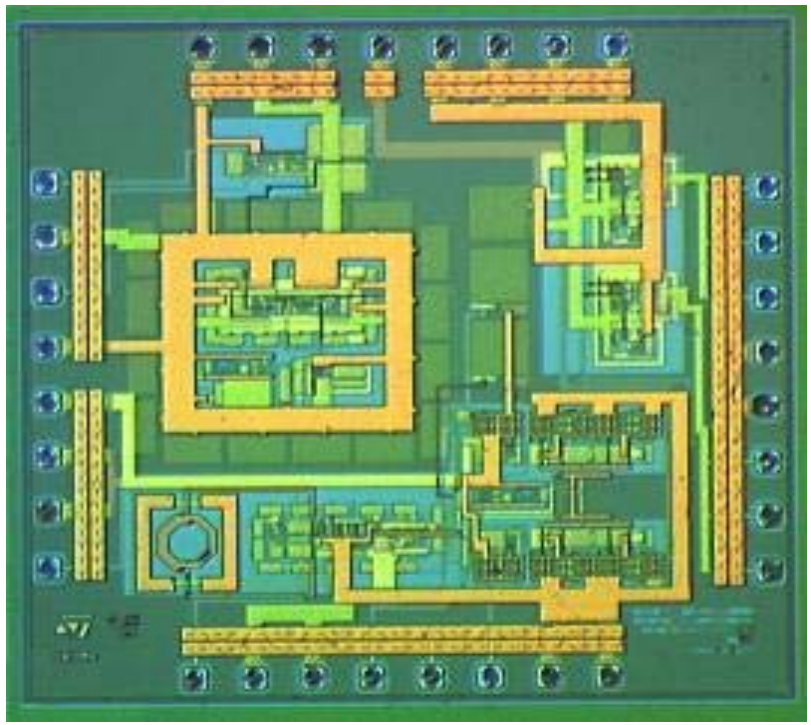
Backend Status

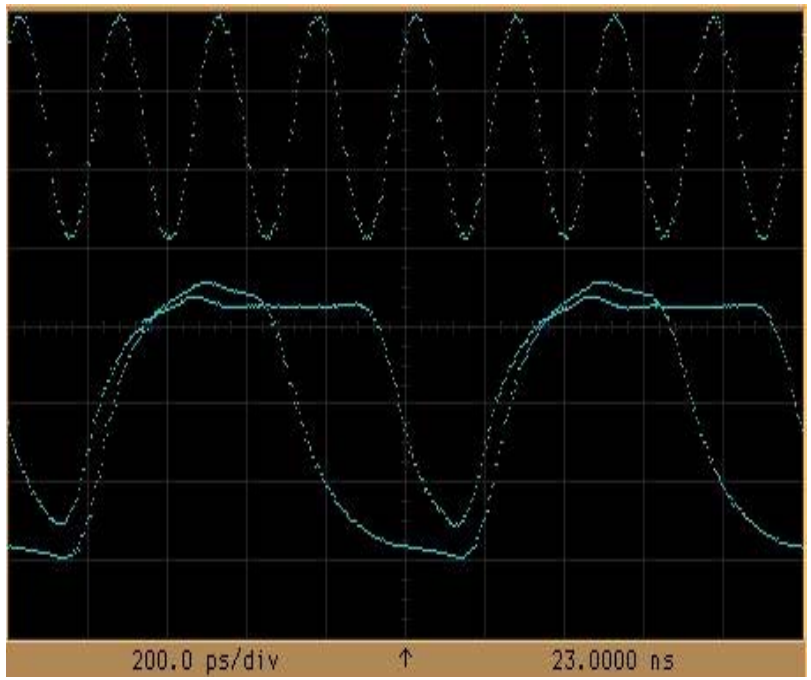
- Digitizer/ Demux
  - 3 generations of ASIC digitizer design and production in cooperation with STMicroelectronics R&D
  - 2 demultiplexer designs (SiGe and GaAs ASICs plus FPGAs)
- IF Data Transmission
  - Fiber optic system design and benchtop demonstration of 120 Gbps link
- Photonic LO
  - Design and production of 100 GHz waveguide-mounted photomixer
  - Design and demonstration of 390 GHz photomixer
- Apr 2002 - Back End Subsystem PDR

ALMA Project

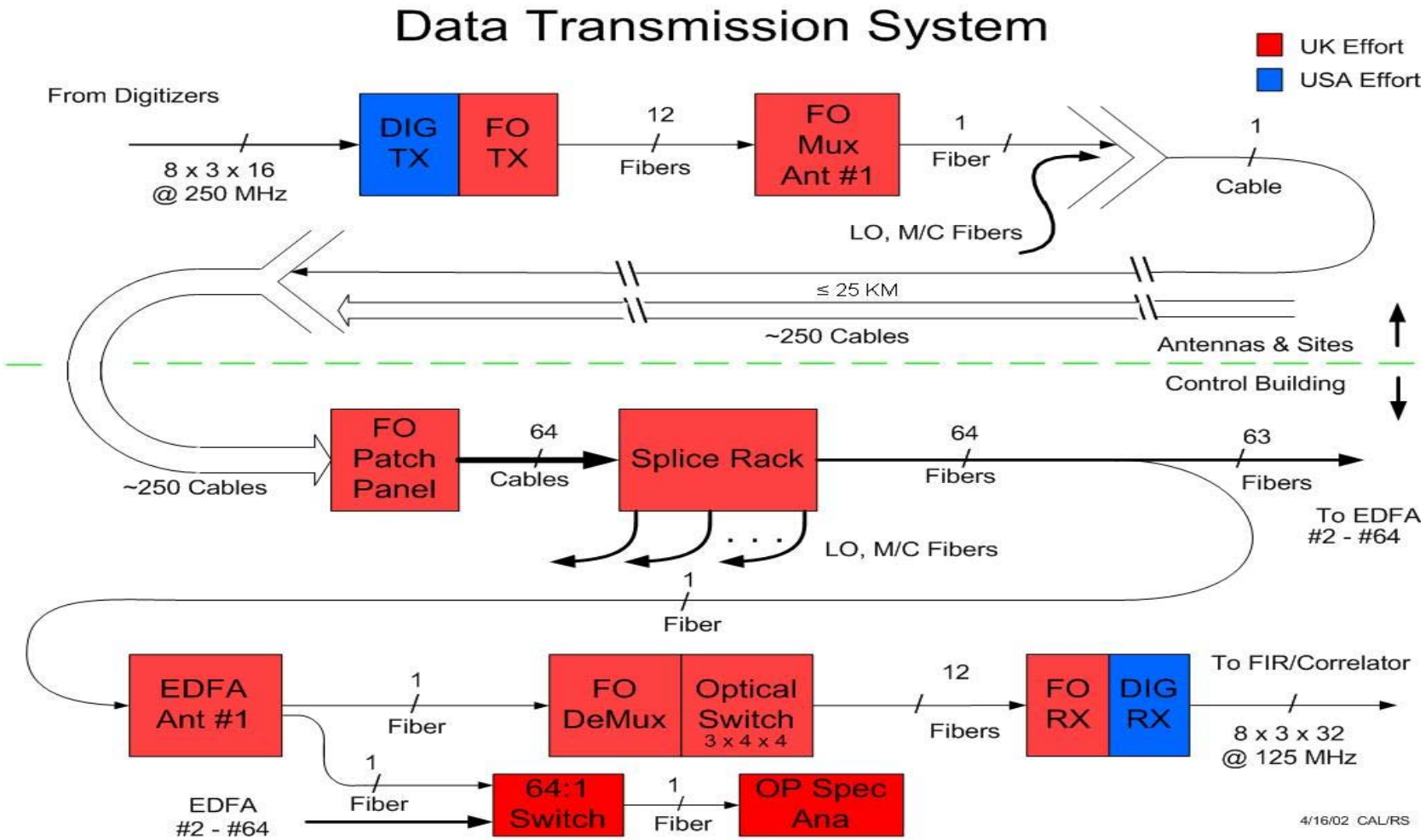
ALMA Digitizer/Sampler

Response to 3 GHz input; clock @ 4 GHz





Fiber Optic Data Transmission



ALMA Project

Back End Phase 2 Work Plan

- Digitizer/Demux
  - Contract with STM for ASIC digitizer final development foundry run, accelerated life test, and device production
  - Produce and test 2 types of demux ASICs
  - Deliver prototype digitizer/demux for Test Interferometer (TI) by end of 2003
  - Deliver 8 pre-production units in 2004-2005
- Sampler Clock
  - Deliver existing IRAM clock for TI by end of 2003
  - Deliver 8 pre-production units in 2004-2005

ALMA Project

Back End Phase 2 Work Plan

- IF Data Transmission
  - Deliver 2 prototype assemblies for TI by end of 2003
  - Deliver 8 pre-production units in 2004-2005
- Photonic LO
  - Complete development of 100 GHz photomixer
    - Two sources of photomixer chips
  - Deliver 8 pre-production photomixers
  - Complete development of OCG (noise, stability, tuning)
  - Deliver 1 pre-production OCG

ALMA Project

Correlator Status and Plan

- Baseline (1st generation) correlator is North American task
  - Prototype baseline correlator nearly completed
- 2nd generation correlator is European task
  - Feasibility study and preliminary design studies completed in cooperation with Japan
  - Only preliminary design planned in Phase 2
  - Detailed design and prototyping will be included in FP6 proposal for ALMA infrastructure construction