# DBBC4

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# DBBC4

- The fourth generation of the DBBC backend family
- Evolution in continuity – compatibility with previous generation
- New concept with legacy features
- New functionalities at the current state of the art technology
- Applications: BRAND, EHT, EVN, IVS, …….
- MPI funding for 4 years (2022-2025) development secured + INFRATEC proposal

- Input bandwidth up to:

8 x 28 GHz = 224 GHz aggregate in digital front- or back-end

plus 8 x 4 GHz = 32 GHz aggregate in ancillary digital front-end

**Total full aggregate = 256 GHz**

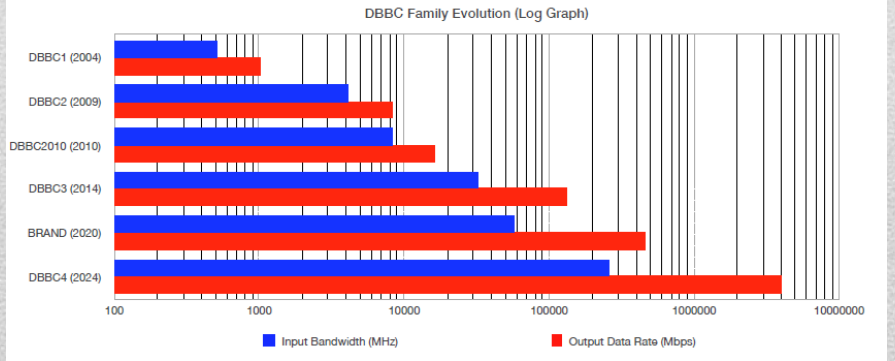
- Output data rate up to: **1 Tbps @ 2-bit**, **2 Tbps @ 4-bit**, **4 Tbps @ 8-bit**

- Modes: DSC (full band for data transfer), OCT (wide bands defined in the input band), DDC(narrow band)

- New functionalities: Burst-mode, Net-to-Memory/Disk capability, AI-mode. The system includes for the first time in a VLBI backend an AI dedicated hardware module (A-EYE) for implementing embedded artificial intelligence functionalities

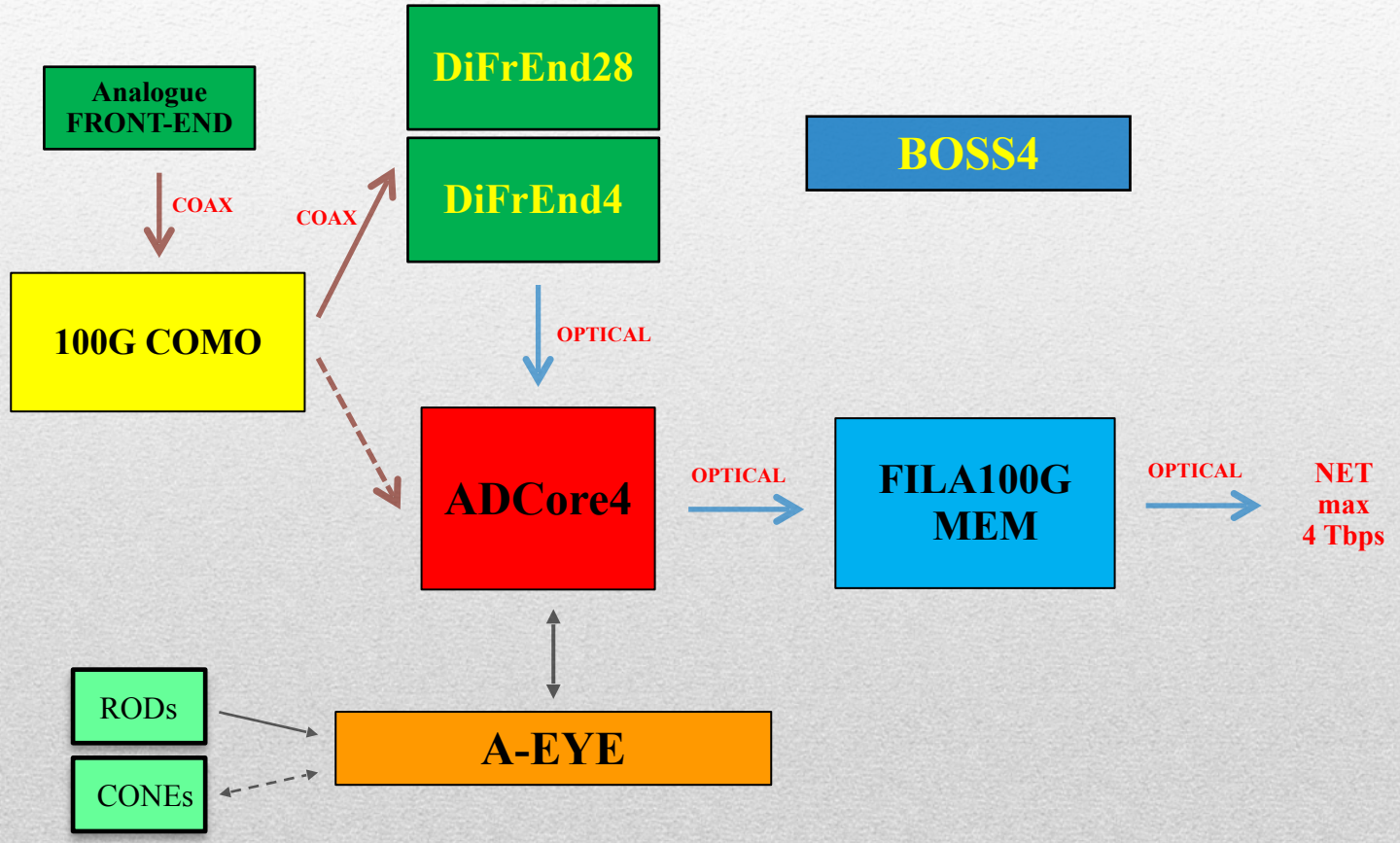
DBBC Family Evolution (Table)

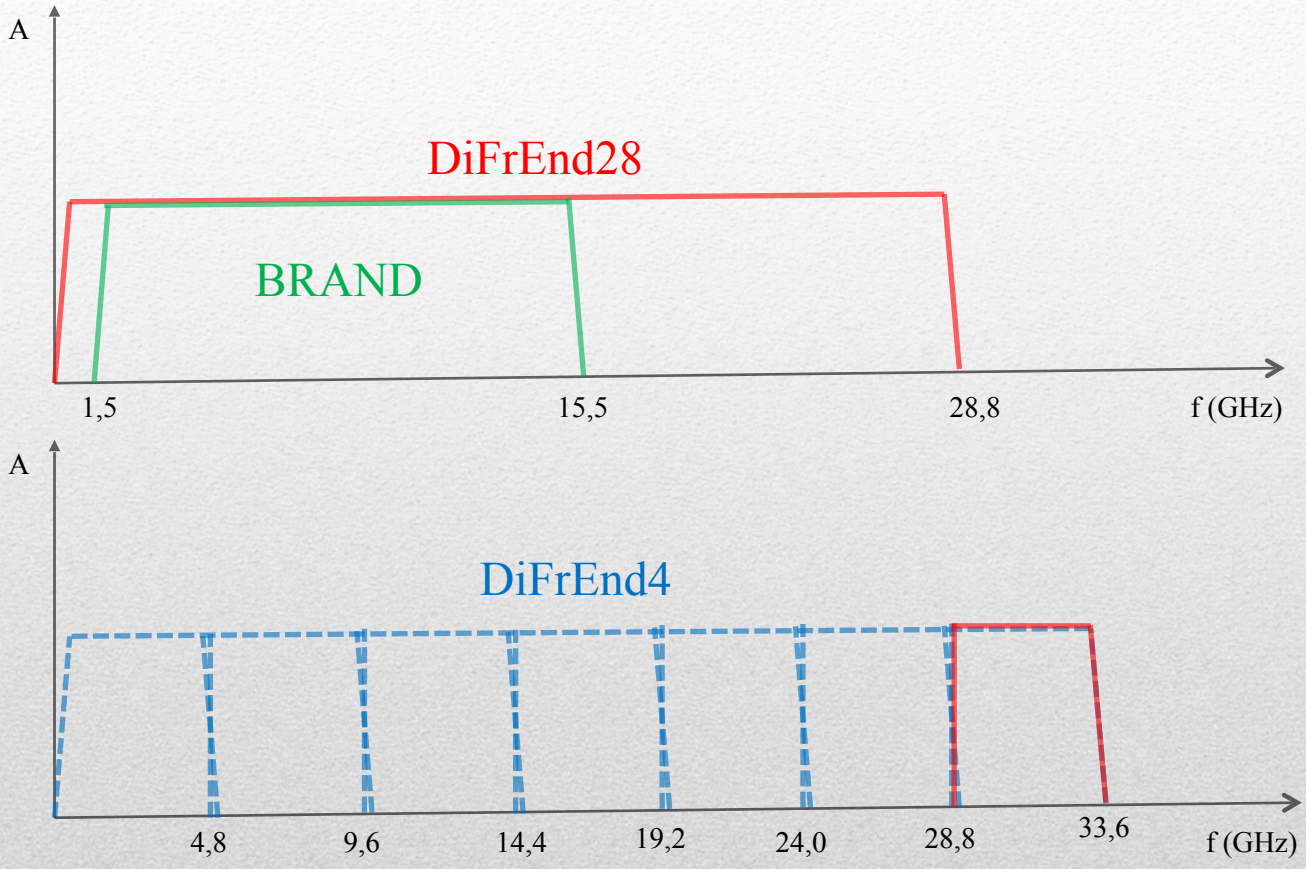
| | DBBC1 (2004) | DBBC2 (2009) | DBBC2010 (2010) | DBBC3 (2014) | BRAND (2020) | DBBC4 *(2024)* |
|---|---|---|---|---|---|---|
| Max Input Bandwidth (MHz) | 512 | 4096 | 8192 | 32168 | 57600 | 256000 |
| Max Output Data rate (Mbps) | 1024 | 8192 | 16384 | 131072 | 460800 | 4000000 |




# DBBC4

# DBBC4 ARCHITECTURE





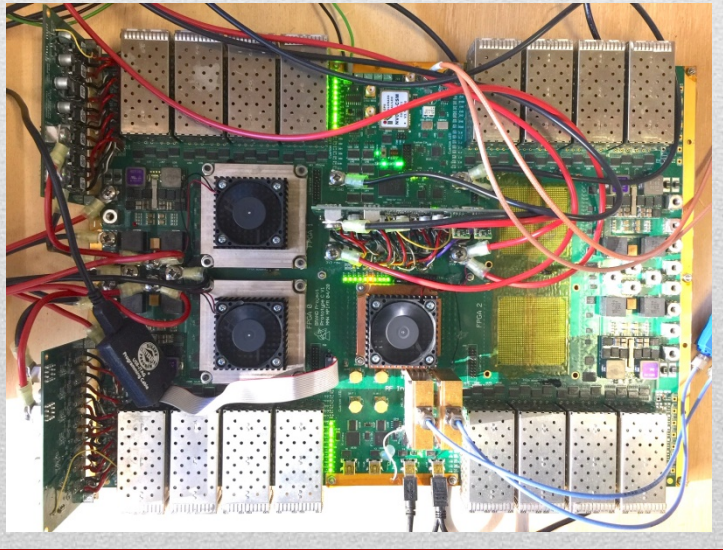

# Band coverage

- Signal conditioning module for the sampling optimization
- Double polarization for the entire band (up to 32 GHz)
- Automatic and manual gain control
- Total power measurement
- Maximum 4 units in one system
- Autonomous edge controller

# 100GCoMo

- Evolution of the BRAND DigitalFrontEnd
- Input: 2 Channels 28,8 GHz bwd / 4 channels 14,4 GHz
- Representation: 8-bit sampling full band
- Digital process: filteres and channels combination
- Output: full or limited band
- Output media: aggregate optical CFP 100G

# DiFrEnd28



- New concept
- Input: 2 Channels 33,6 GHz max / 4,8 GHz bandwidth
- Representation: 12-bit sampling
- Seven possible locations of pre-filtered analogue bands
- Output: digital 4,8 GHz band
- Output media: aggregate optical CFP 100G

# DiFrEnd4

- Processing module
- Receives sampled data from DiFrEnd28 and DiFrEnd4
- As alternative can be populated with local samplers
- Provides massive digital computing
- Provides broad bandwidth communication with the A-EYE controller
- Produces data output for FILA100G-MEM/correlators/recorders
- Maximum 4 units in one system

# ADCore4

- Buffered storage
- Burst mode recording
- Direct recording on SSD and NVMe disk modules
- Streaming sub-bands to correlators for real-time fringe verification

# FILA100G-MEM

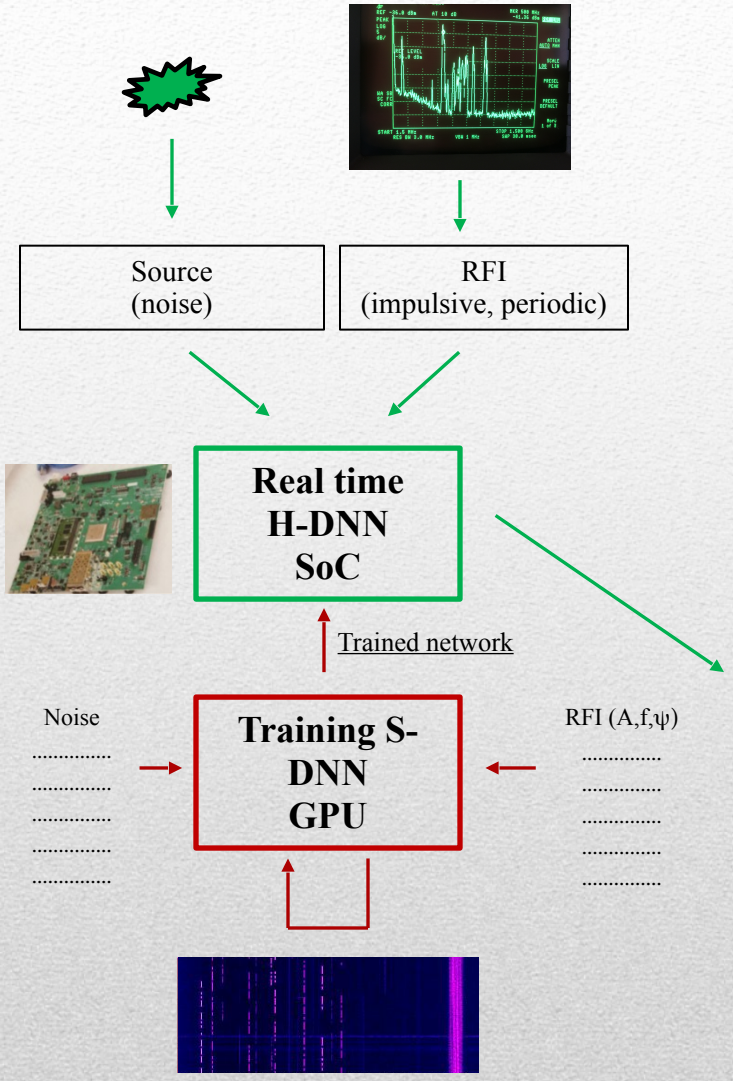
- Artificial Intelligence controller
- A number of possible real-time applications:
    - RFI mitigation
    - Pulsar detection
    - Fast Radio Burst detection
    - Radio anomaly detection
    - ... and more
- RODs and CONEs act in support as sensors and edge computing respectively

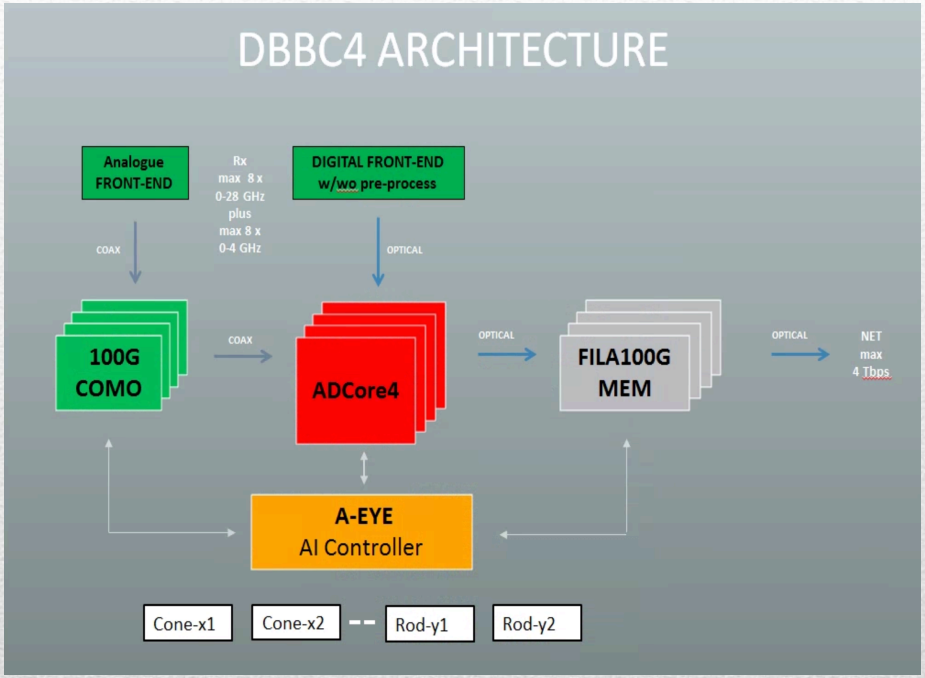
# A-EYE

**Real time AI APPs under development in DBBC4:**

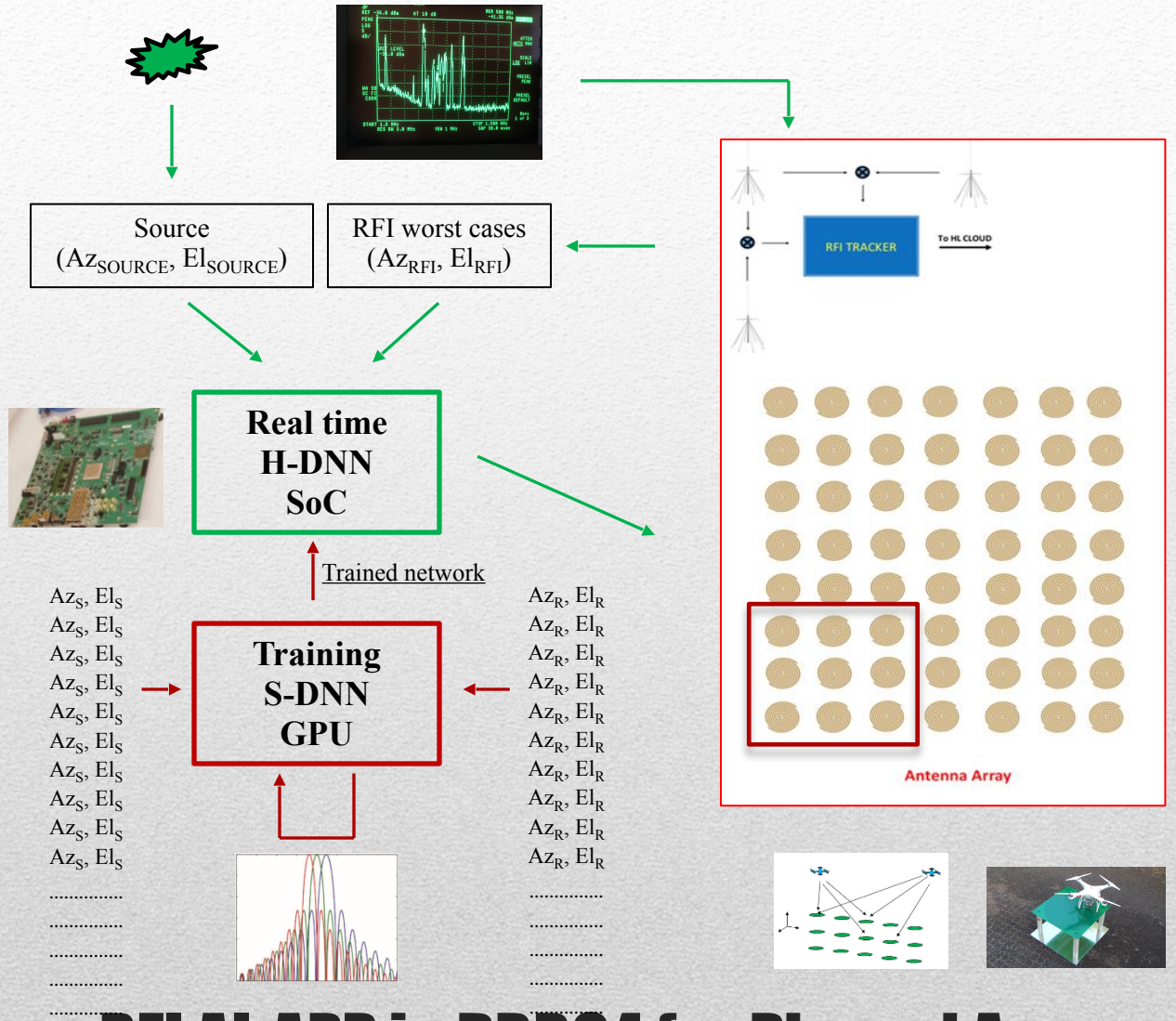
- Mitigation of periodic and impulsive RFI
- RFI mitigation in PAF (Phased Array Feed)

# Phased Arrays - PAFs and AI




# RFI AI-APP in DBBC4 for pulses




# RFI AI-APP in DBBC4 for Phased Arrays and PAFs

**THANKS! QUESTIONS?**

# End