DBBC3
A Full Digital Implementation of the VLBI2010 Backend

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DBBC3

- Project supported by EU Radionet3
- Partner:

  INAF – Italy

  MPIfR - Germany

  OSO – Sweden
- Formally starting date July 2012, 3 years

Background

- Astronomic VLBI requires improvement in the overall sensitivity (4Gbps EVN, mmVLBI)
- Geodetic VLBI requires improvement in delay determination (VLBI2010)
- Current state of the art technologies offer new opportunity
- Two generation of the DBBC system represent a good platform

DBBC Evolution

DBBC1   2004 - 2008

     in: 4 x IF-512MHz

     out: **DDC** 16xbbc(1-2-4-8-16MHz)@32MHz

         0.512/1.024Gbps

DBBC2   2007 – to date

     in: 4 x IF-512/1024MHz

     out: **DDC** 16xbbc(1-2-4-8-16MHz)@32MHz

      PFB 4 x 16 x 32MHz@64MHz

         4.096/8.192Gbps

DBBC2010   2009 – to date
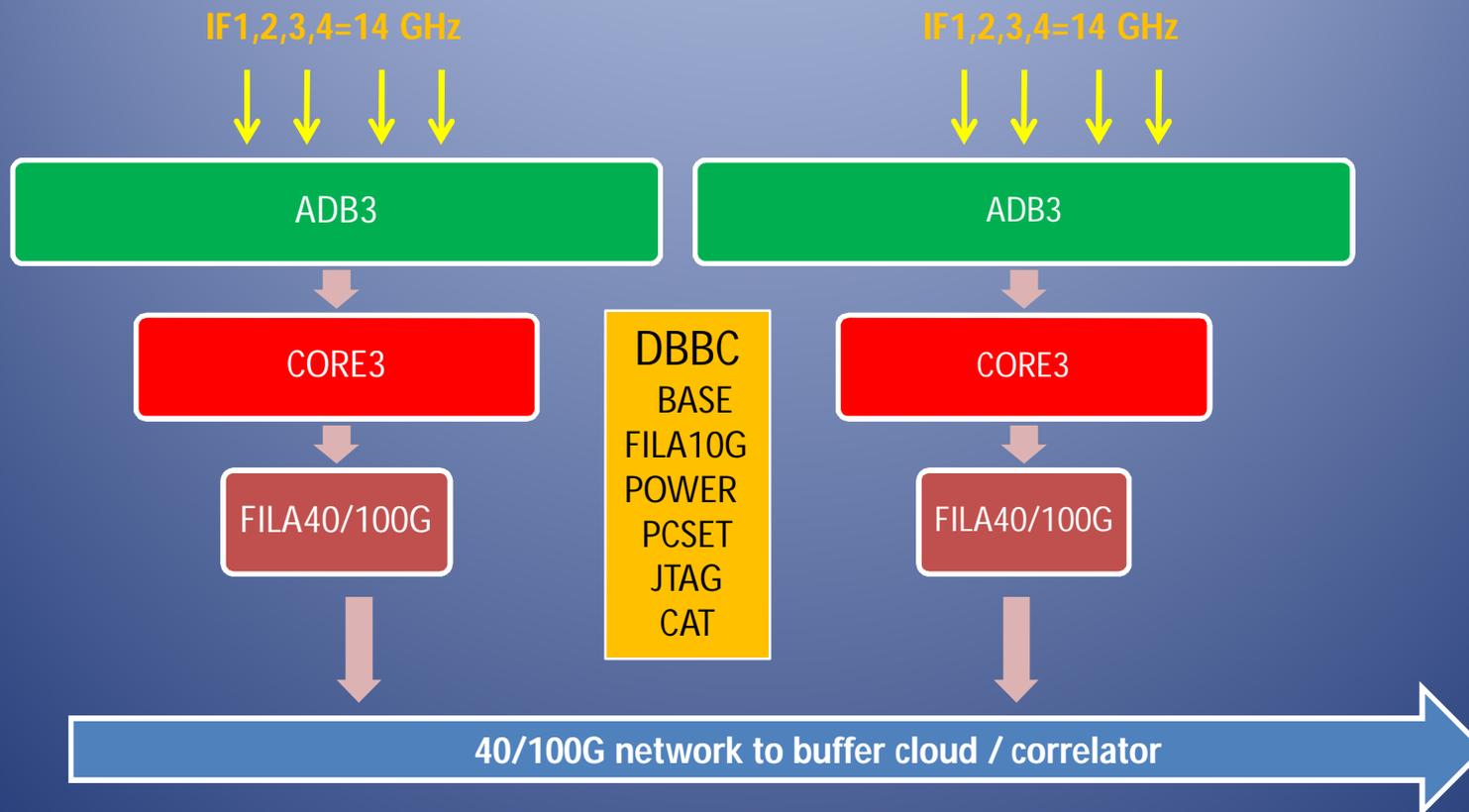
     in: 8 x IF – 512/1024MHz
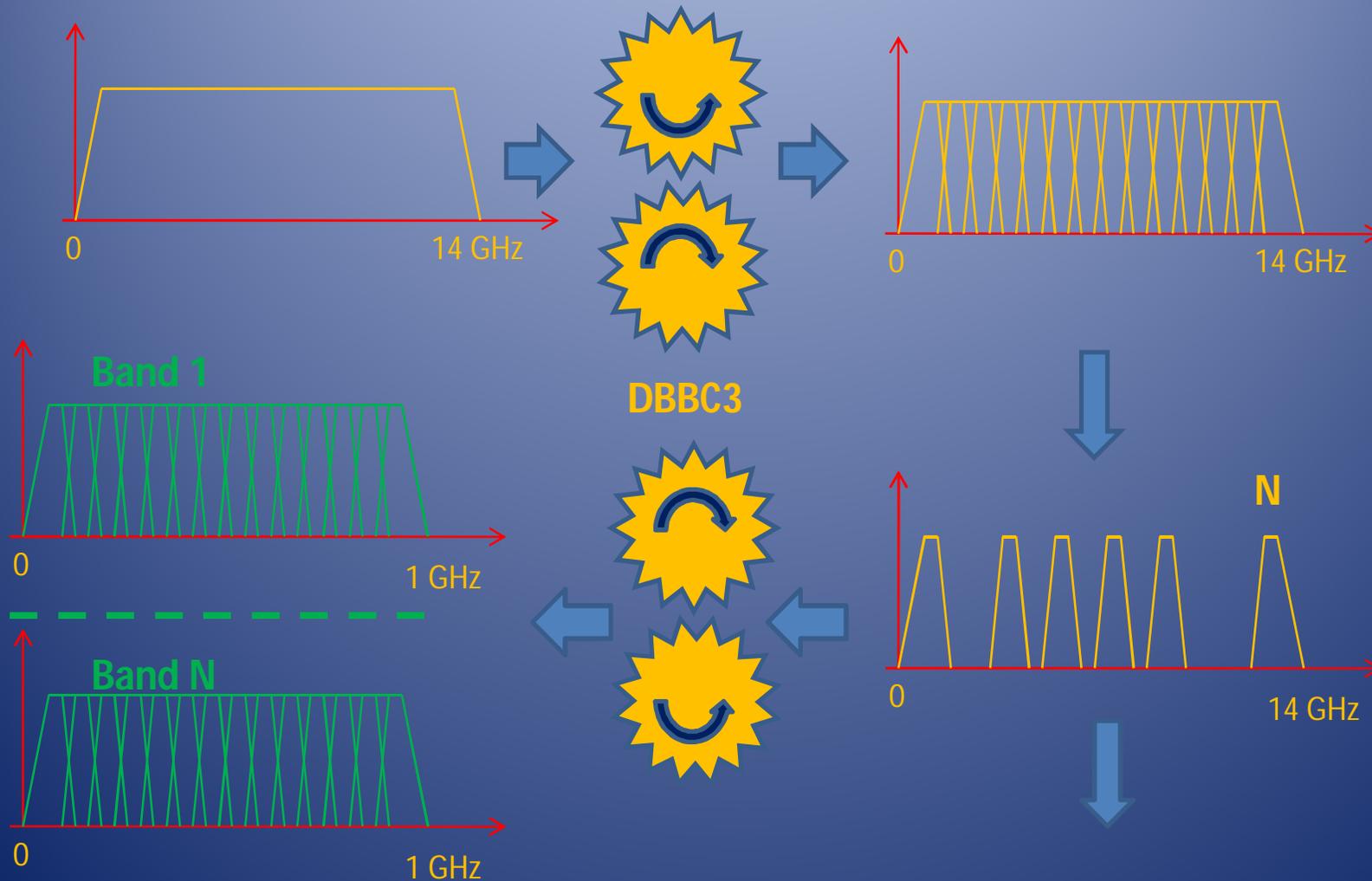
     out: **PFB / DSC**   **16.384/32.768Gbps**

DBBC3 General Performance

- Number of Input IF: **4**

- Instantaneous bandwidth each RF: **14 GHz**

- Sampling representation: **8 bit**

- Processing capability: max **10 TMACS** (multiplication-accumulation per second)

- Output: max **1.4 Tbps** (64b/66b encoded)

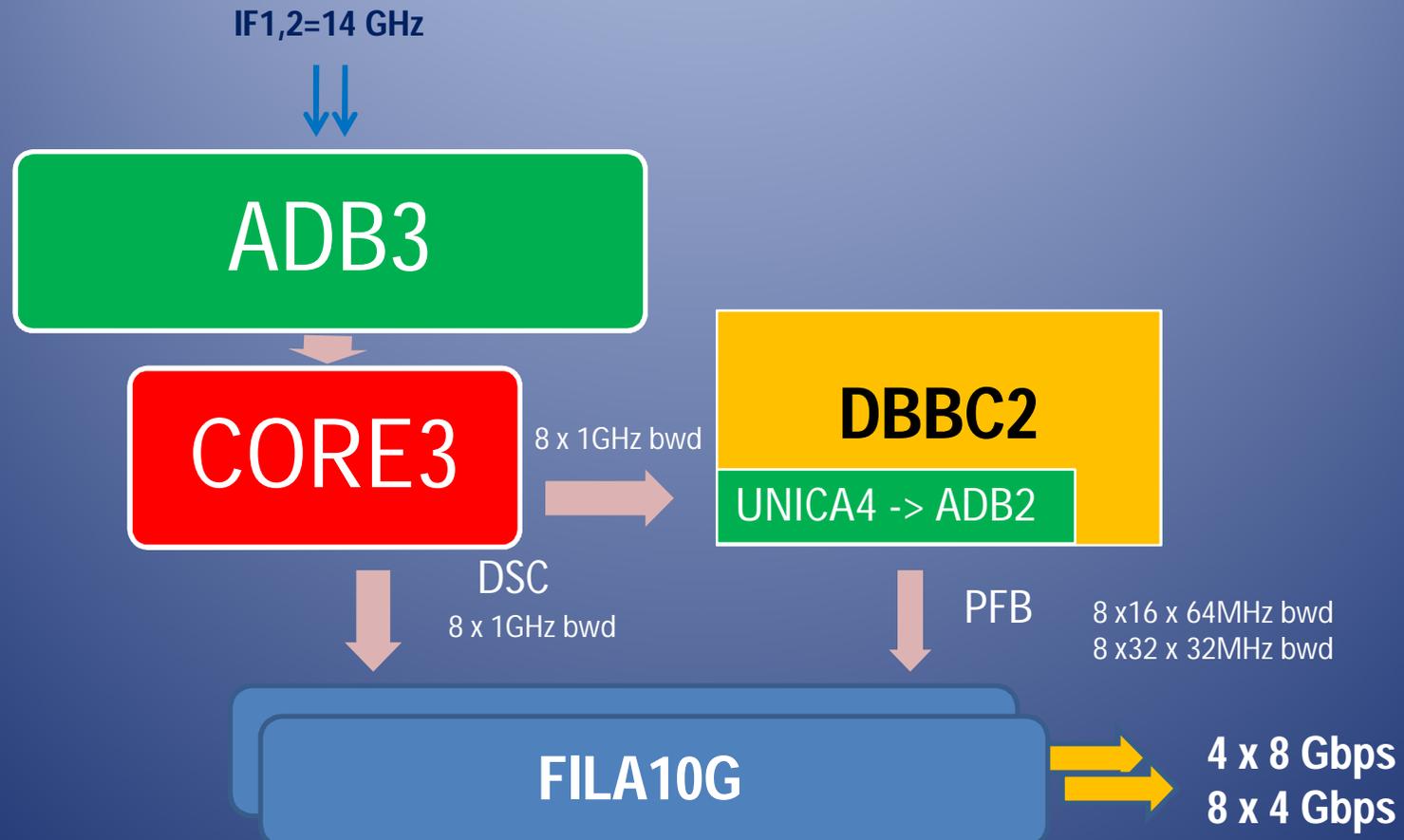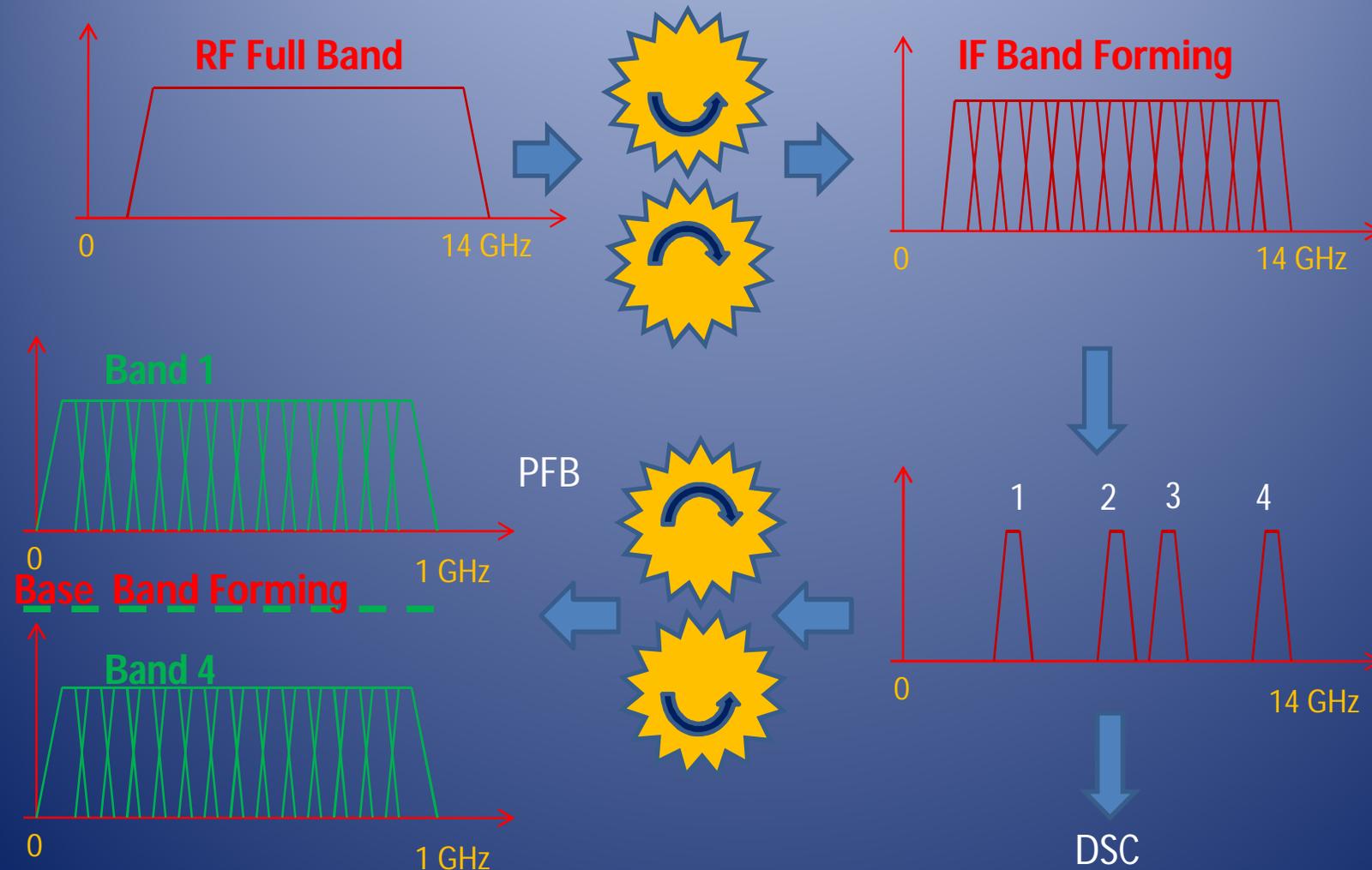- Compatibility with existing DBBC environment

Full Band Digital Direct Conversion (each RF band)

DBBC3 Architecture to support VLBI2010
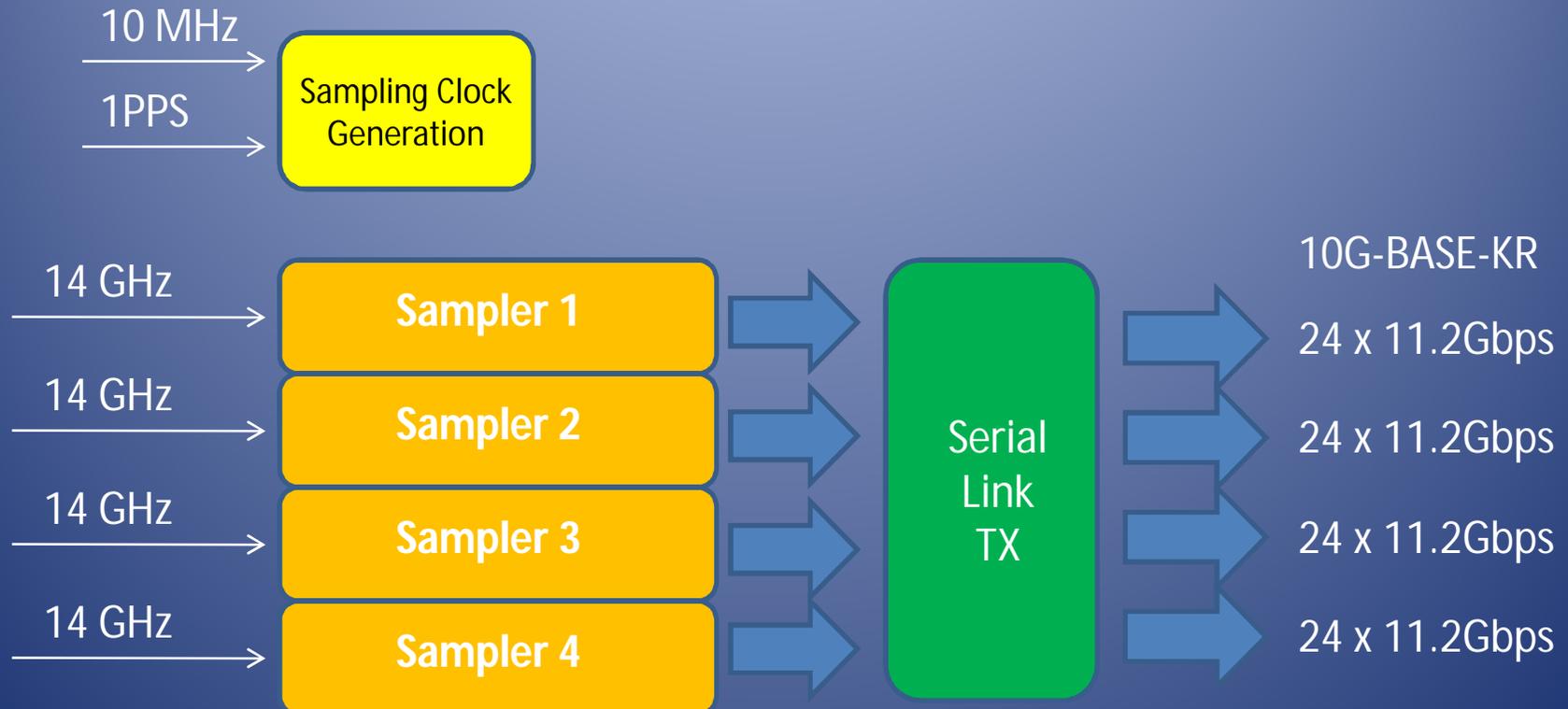
IF1,2=14 GHz

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ADB3

CORE3

8 x 1GHz bwd

DBBC2

UNICA4 -> ADB2

DSC
8 x 1GHz bwd

PFB

8 x16 x 64MHz bwd
8 x32 x 32MHz bwd

FILA10G

➡ **4 x 8 Gbps**
➡ **8 x 4 Gbps**

VLBI2010 Conversion Chain
(each polarization)

RF Full Band

0   14 GHz

IF Band Forming

0   14 GHz

Band 1

0   1 GHz

Base Band Forming

Band 4

0   1 GHz

PFB

1   2   3   4

0   14 GHz

DSC

ADB3 Sampler

10 MHz →

1PPS →

Sampling Clock Generation

14 GHz → **Sampler 1**

14 GHz → **Sampler 2**

14 GHz → **Sampler 3**

14 GHz → **Sampler 4**

Serial Link TX

10G-BASE-KR

24 x 11.2Gbps

24 x 11.2Gbps

24 x 11.2Gbps

24 x 11.2Gbps

FILA40/100G

4 x 10 Gbps → **40G Packet Forwarding Engine** → 4 x 10 Gbps → **40G 4 lambda transceiver** → GLASS

10 x 10 Gbps → **100G Packet Forwarding Engine** → 4 x 25 Gbps → **100G 4 lambda transceiver** → GLASS
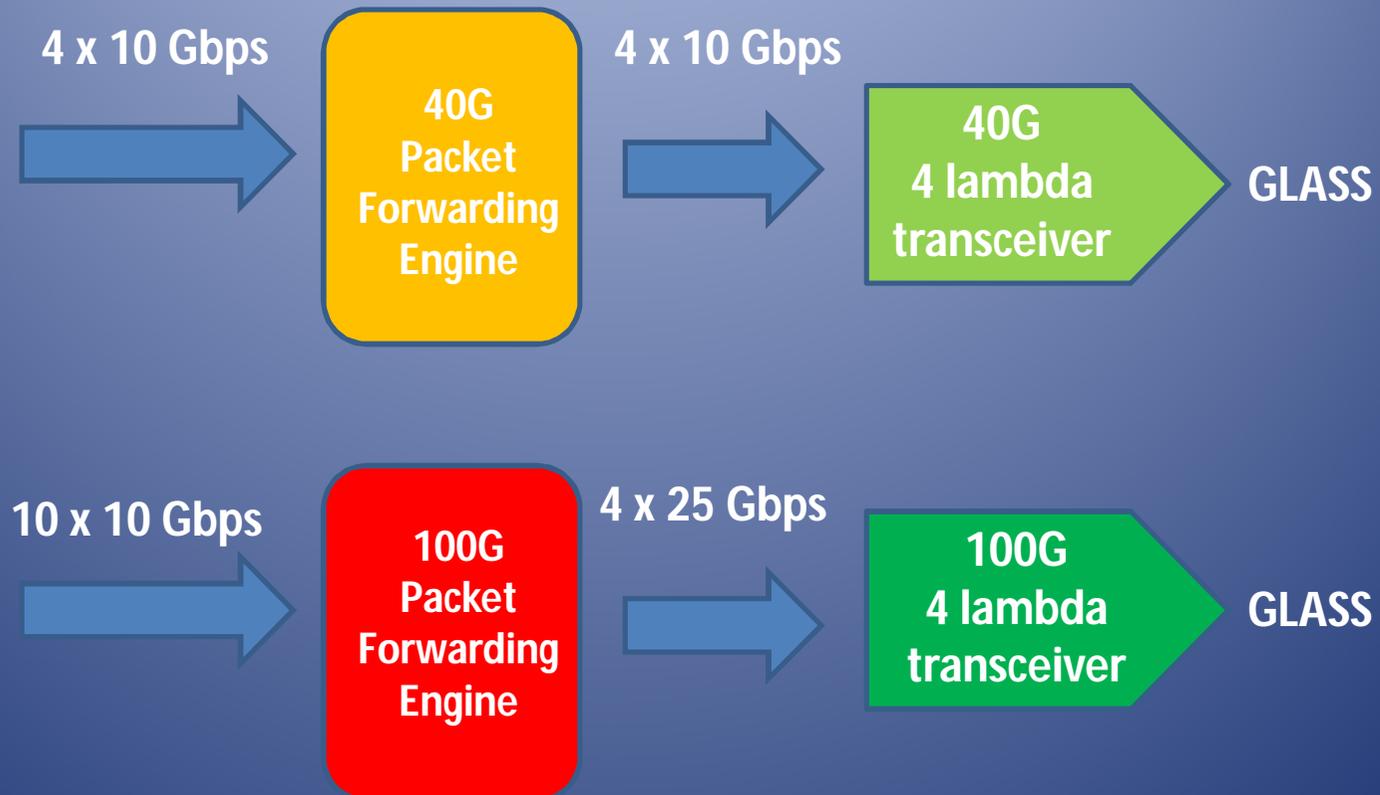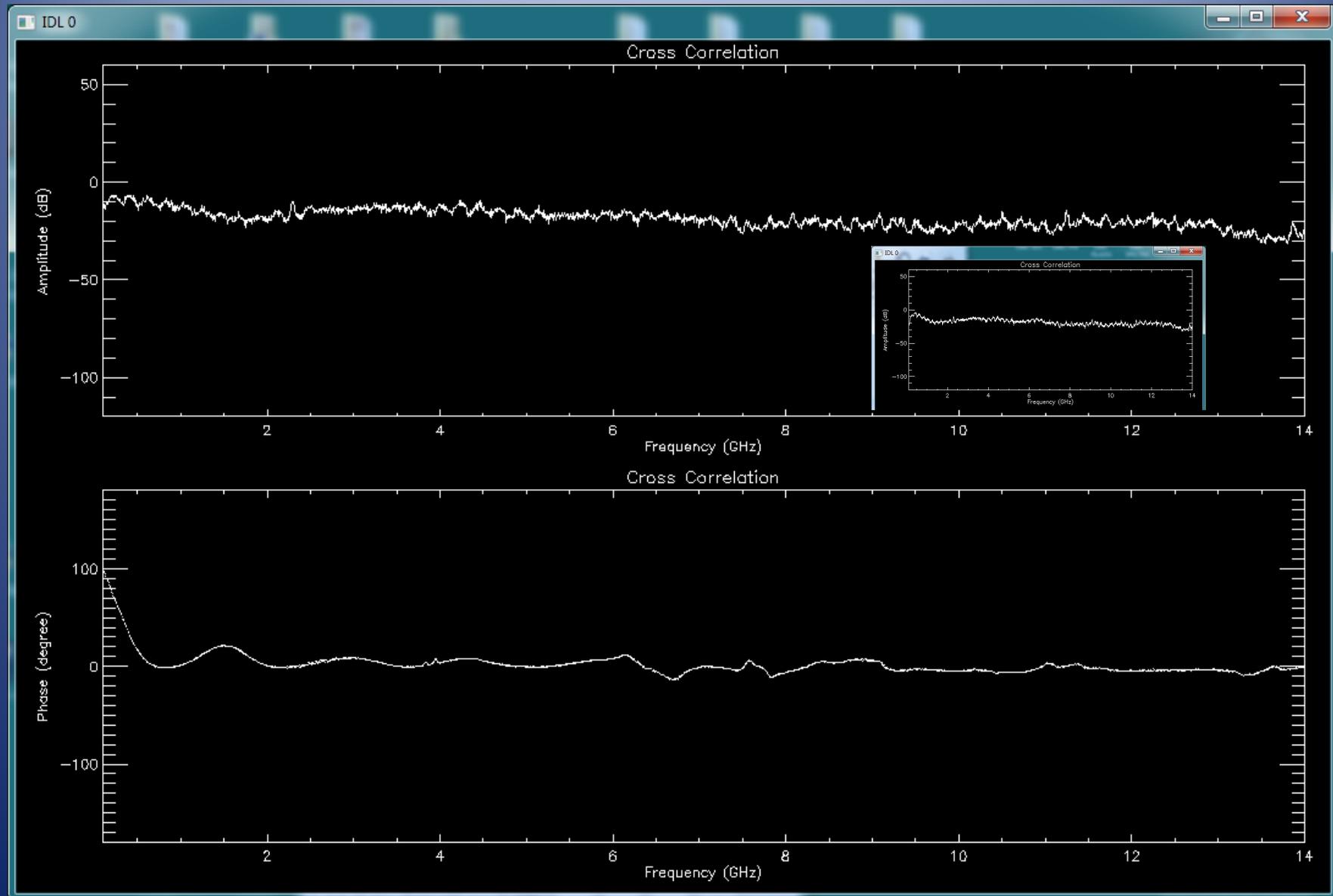
Status and planning

- ADB3 project underway: second series with two prototypes available

- Measurements in lab showed good performance in cross-correlation amplitude and phase

- Test in antenna as soon as available 2-14 GHz feeds

- Core3 firmware for VLBI2010: 4 IF forming under development, tunable 100dB class pass-band filters

- The project **must** produce deliverables in 3 years

ADB3 – Prototype second series

THANK YOU – Questions?