

RadioNet – JRA: BRAND EVN

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TOG Meeting
Shanghai, 19 MARCH 2018

- ▣ Develop a prototype prime focus very wide-band receiver for the frequency range 1.5 GHz – 15 GHz

Partners

MPI

INAF

ASTRON

OSO

UAH

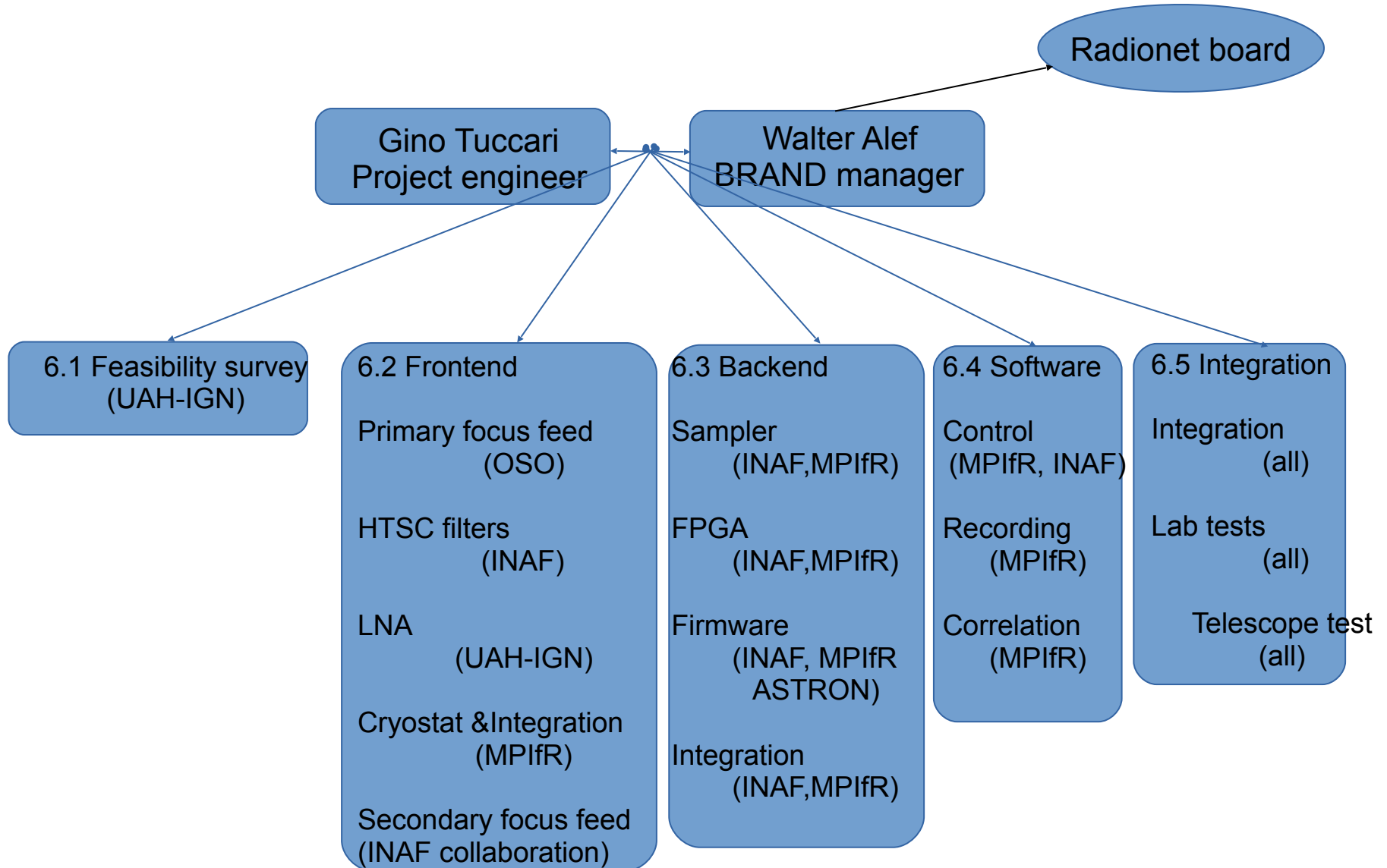
VUC

- ▣ Duration 42 months 42, started 1/2017

Enormous simultaneous bandwidth:

- New scientific opportunities with multi-wavelength on EVN
 - VLBI mapping
 - Spectroscopy
 - Polarimetry
 - Single dish
 - VGOS compatibility
- Unique capability for EVN
- Reduce maintenance cost
- Simplify operations

WP6 - Job Distribution



Deliverable of Task 6.1 “Feasibility study of EVN antennas”
finished, deliverable submitted

Document will be updated during project duration

GENERAL STRUCTURE using

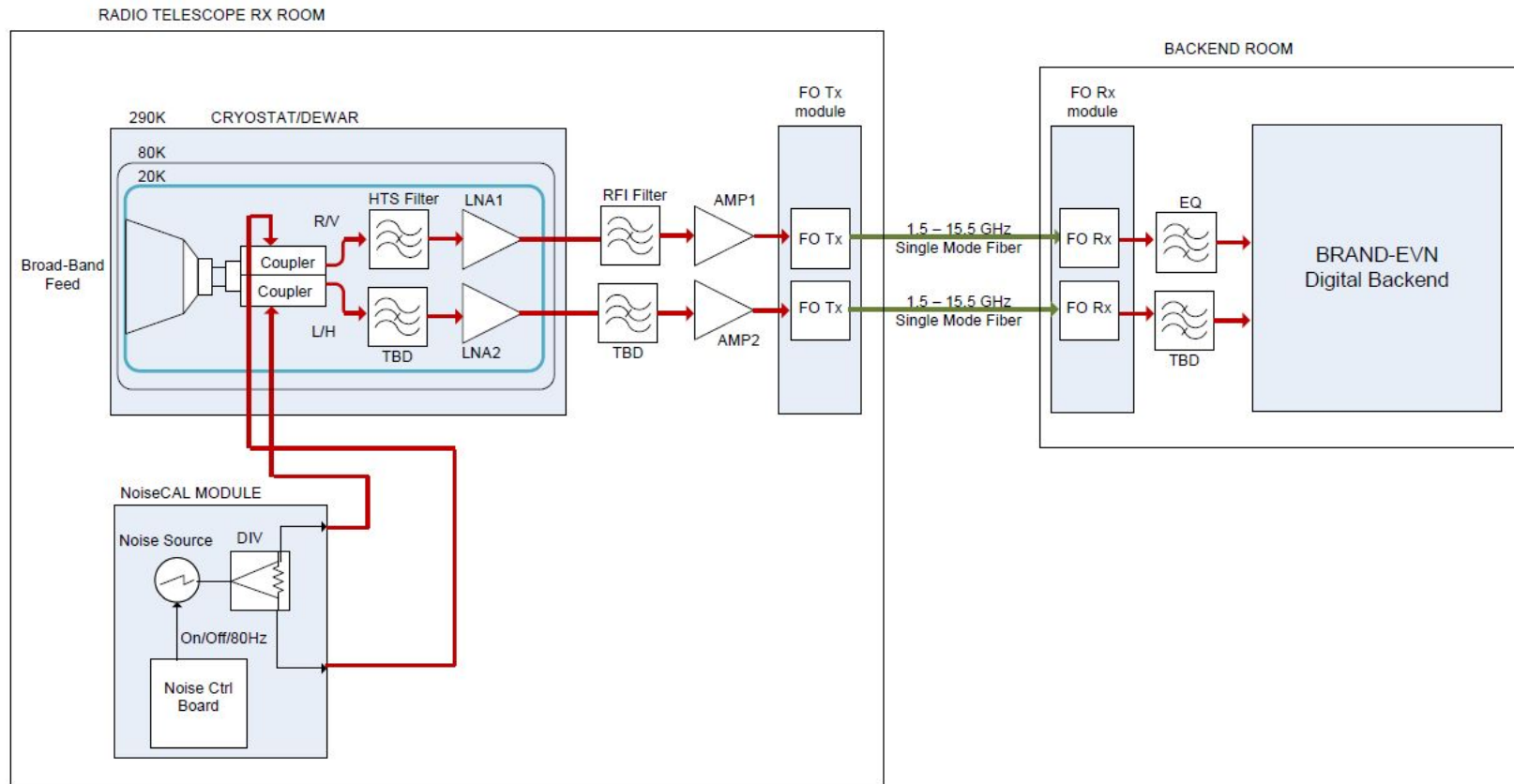
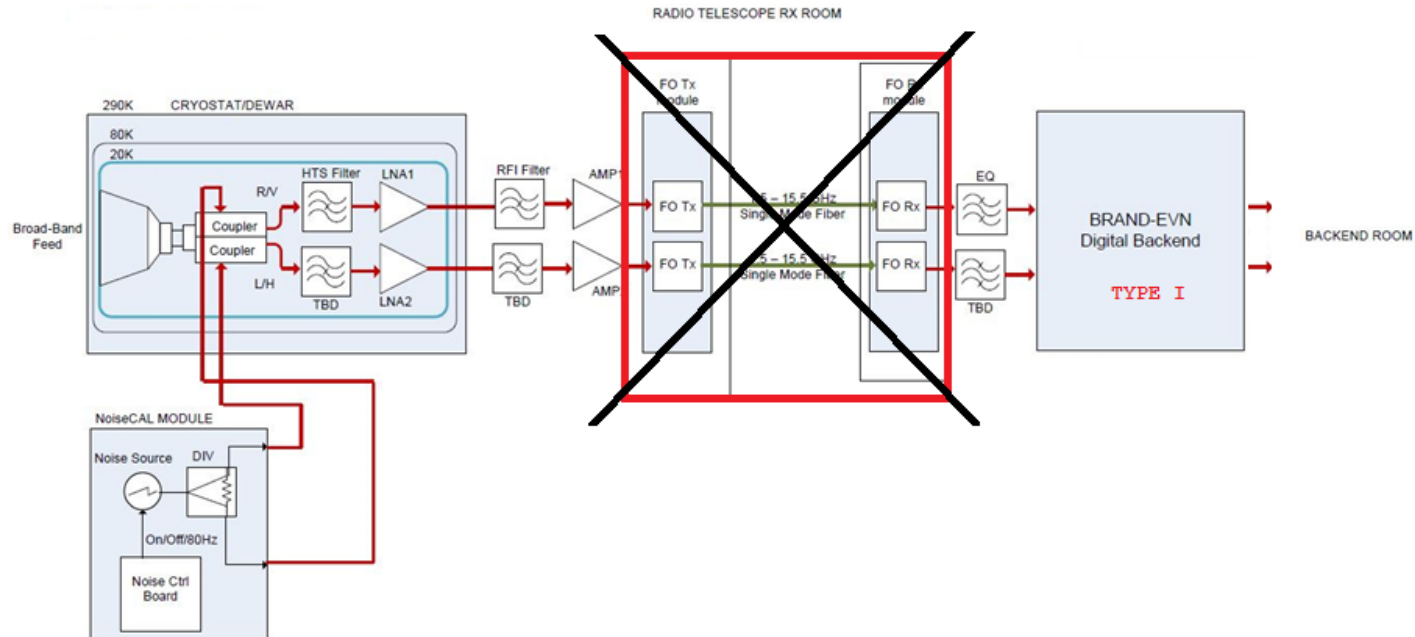
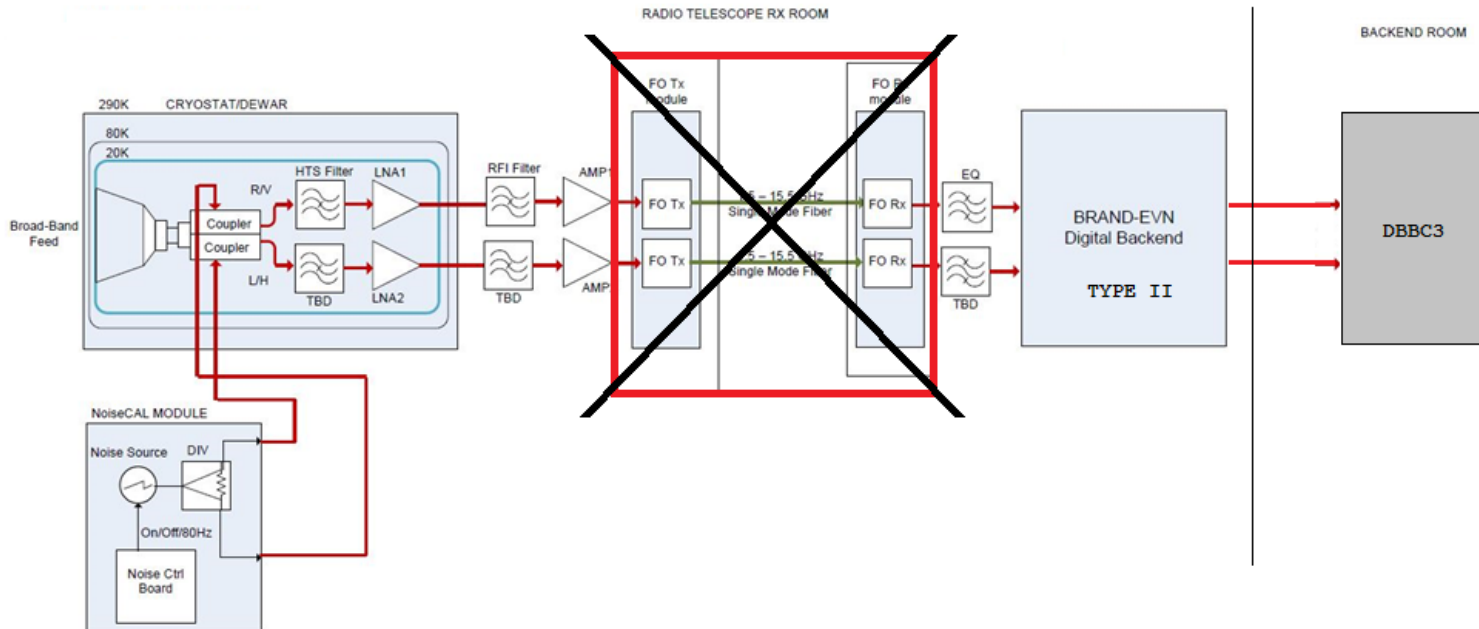


Figure 1: Broad-band receiver block diagram.

TYPE I STRUCTURE



TYPE II STRUCTURE

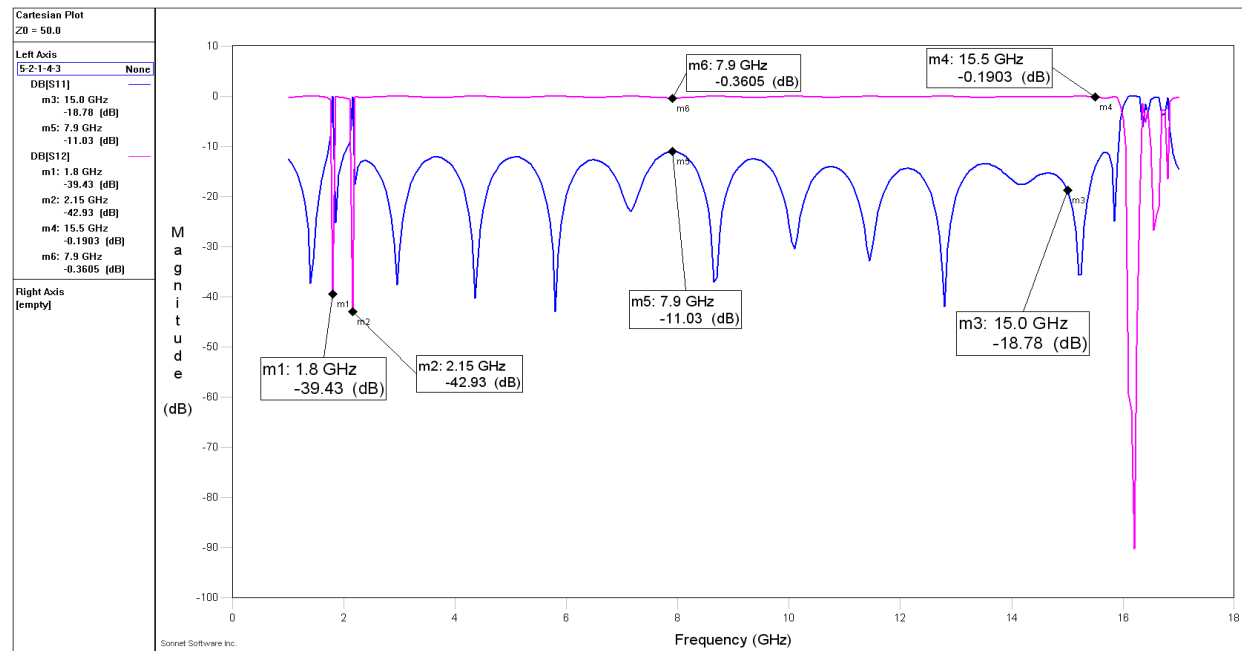


Onsala developed a feed for BRAND (Effelsberg)

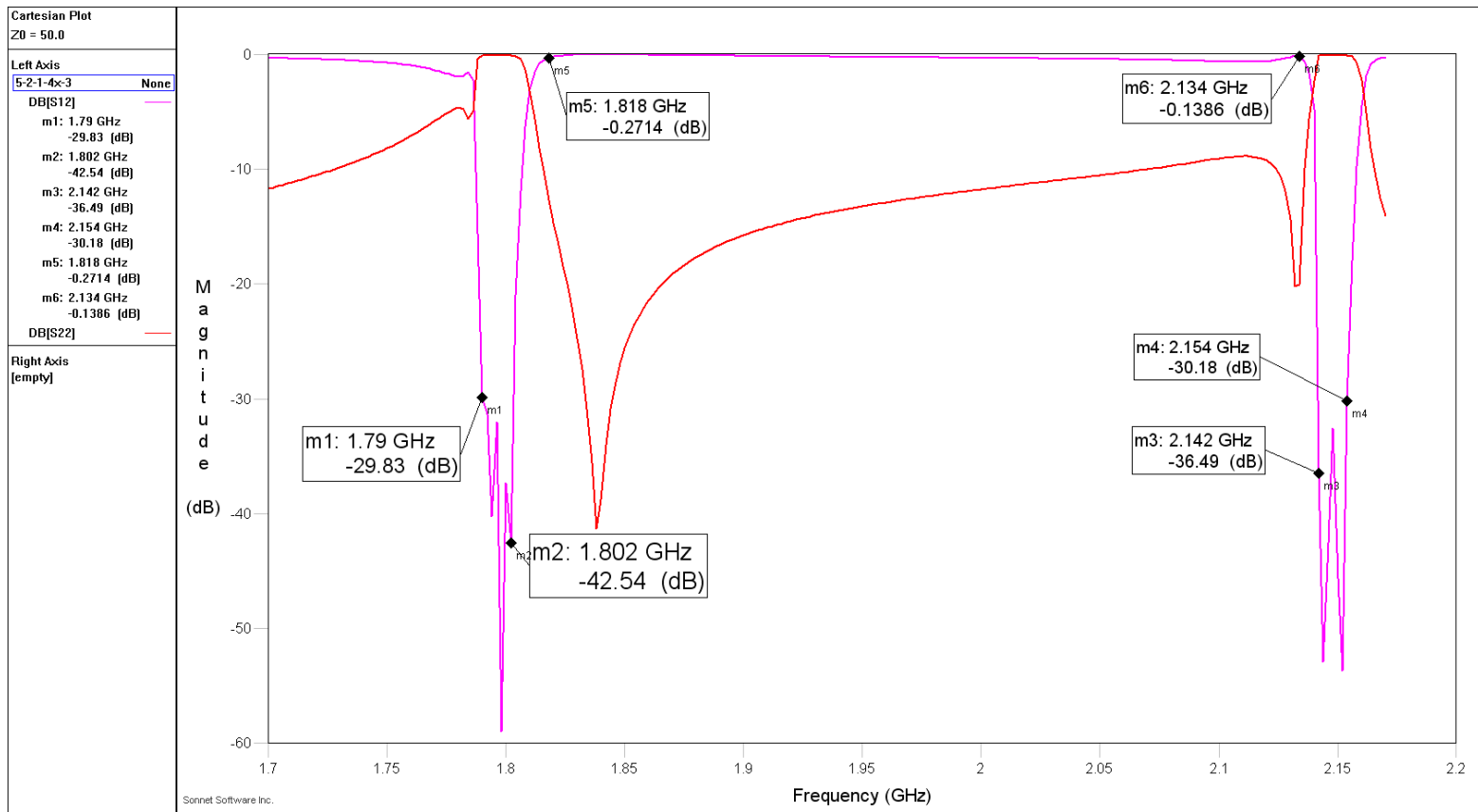
- Prime-Focus (Effelsberg)
- Angle $79^\circ \times 2$ (Effelsberg)
- $f/D = 0.30$ (Effelsberg)
- $D = 100$ m (Effelsberg)
- Freq. = 1.5 – 15.5 GHz
- Quad-Ridge Flared Horn (QRFH BRAND feed)

- ▣ High Temperature Superconductor (HTS) filters:
 - Proposed more manufacturer for the filters
 - At least 2 collaborations for development of filters
 - RFI to be reduced by filter has been defined

First HTS filter simulation for the BRAND range



First HTS filter simulation for the BRAND range (detail)



WP6 - LNA/Amplifier



- ▣ Yebes and Onsala teams involved

- ▣ More versions of LNA covering the broad exist

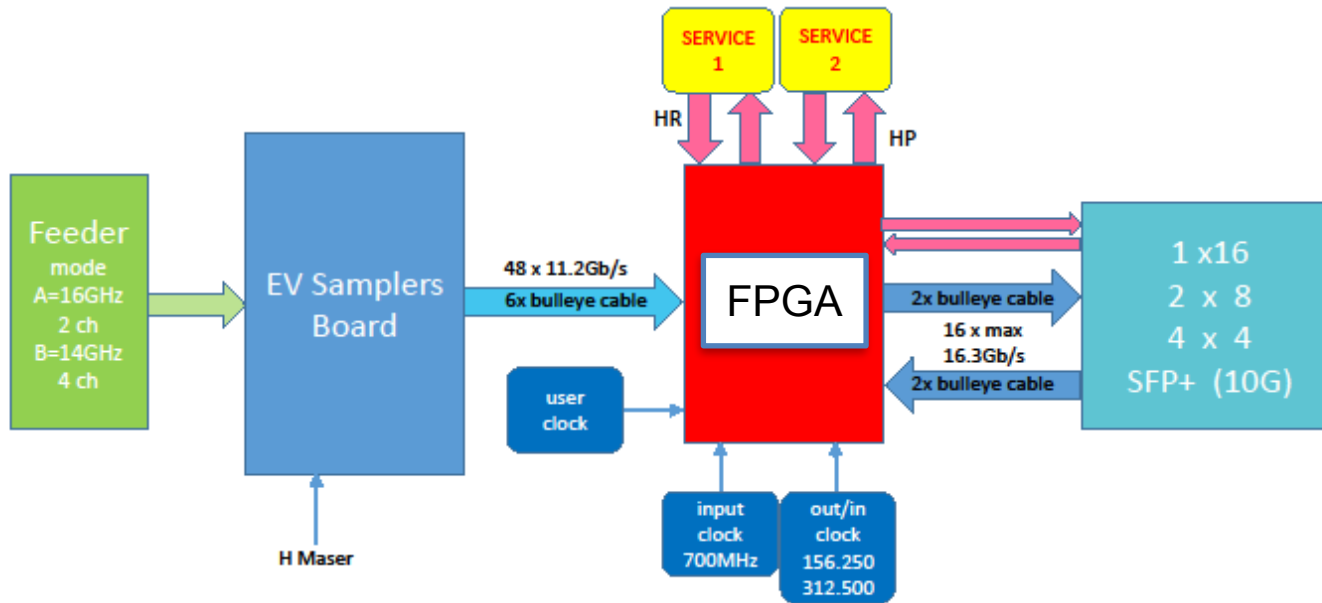
- ▣ Balanced vs. single ended cryo-LNAs under investigation
 - Ultra wide-band high dynamic range could benefit

- 14 GHz (1.5 GHz – 15 GHz) sampler evaluation under way
 - First tests showed somewhat better performance than expected

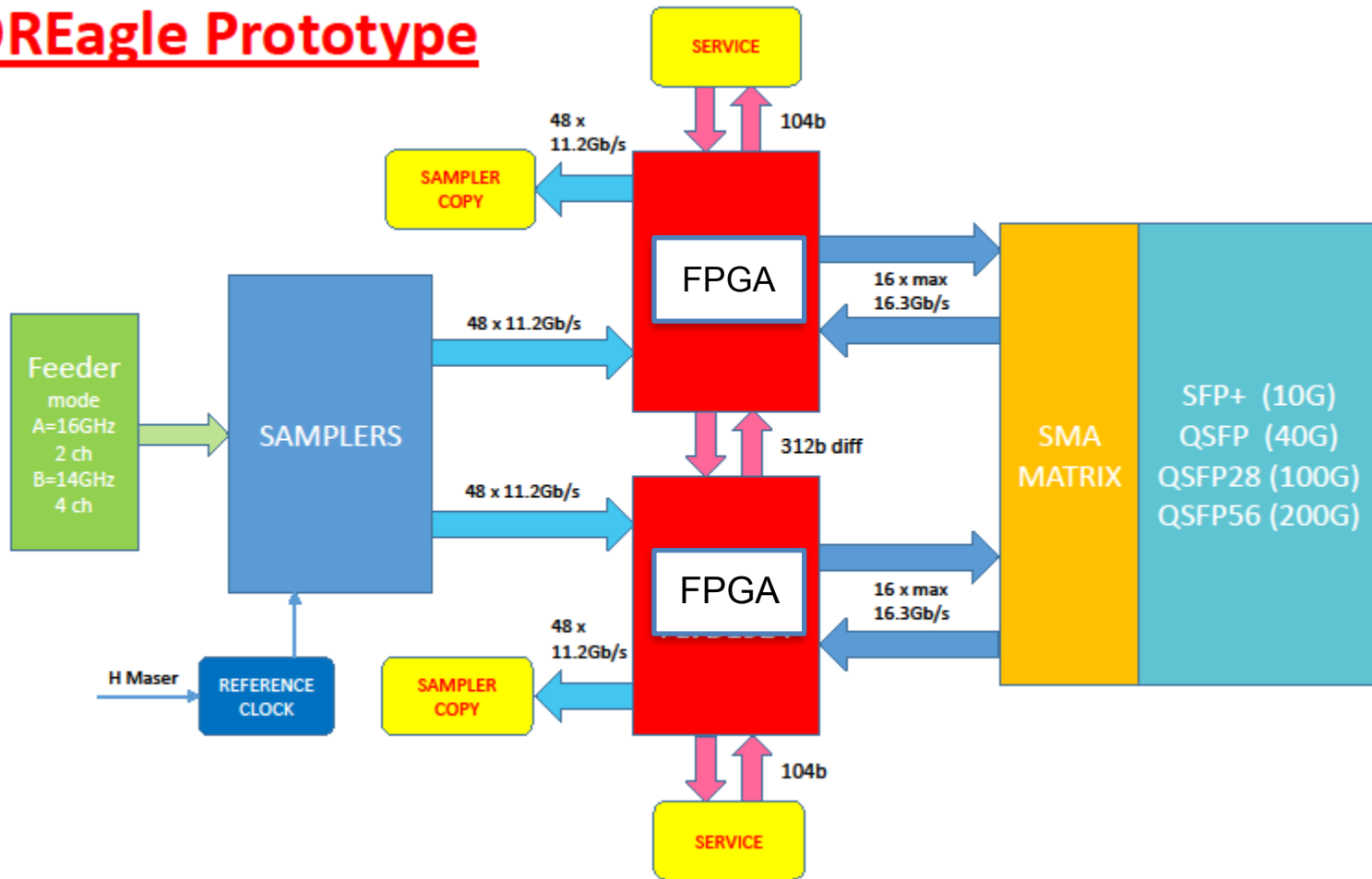
- Communication protocol between sampler and processing FPGA defined in detail

- 2 types of prototypes defined:
 - First prototype: using evaluation board; PCB being designed; FPGA ordered now
 - Second prototype: will complete PCB after evaluation of first prototype

BRAND First Digital Prototype



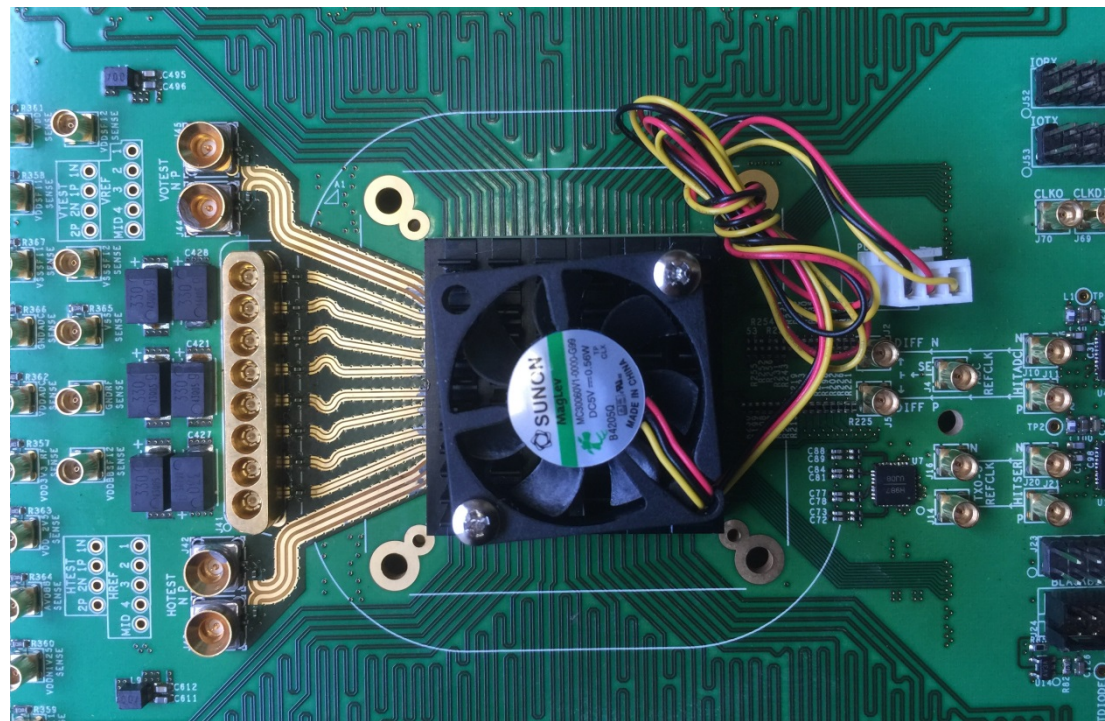
COREagle Prototype



WP6 – Backend

Sampler Evaluation Board

- 4 channels
- 14 GHz bwd
- 8-bit
- local synthesizer
- local decimation
- max output ~ 1 Tbps



- Firmware is under development; tested on DBBC3
 - Good progress: new firmware ready for field
 - Full band DDC and PFB
 - In full band flexible tuning of flexible bandwidth: OCT mode
 - Digital polarisation conversion from linear to circular
 - Digital RFI mitigation

- ▣ Feed horn is being manufactured
 - HTS (High Temperature Superconducting) filters will be designed
 - Combination of LNA and horn will be estimated and improved
 - Specifications for dewar will be defined
 - “type 1” or “type 2” BRAND both possible
 - Will start on building 1st prototype of sampler/processor
 - Design PCB for processor
 - Continue work on firmware

Issues & Solutions

- ▣ So far no real issues in the project
 - running smoother than expected

- ▣ Study of secondary focus feed solutions has not yet started
 - Is not critical for the receiver at all
 - Will be finished end of 2019



RadioNet has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 730562