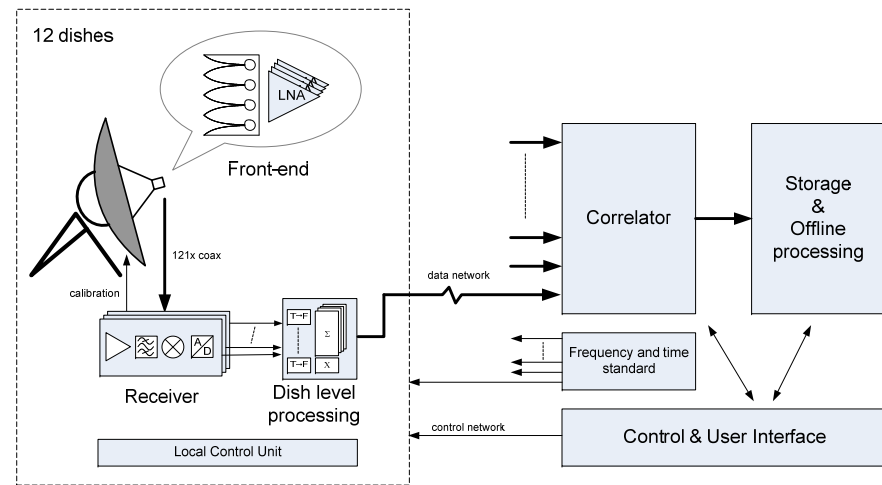


APERTIF

Status update on antennas and front-ends

Wim van Cappellen (cappellen@astron.nl)

March 24, 2010

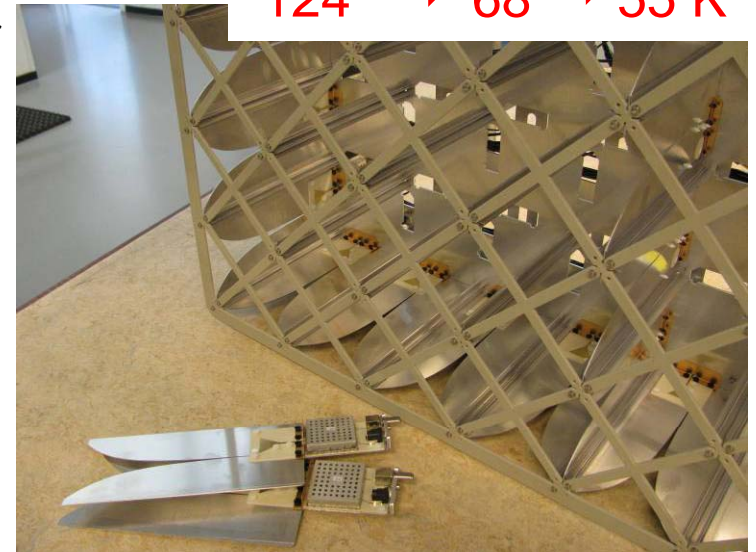
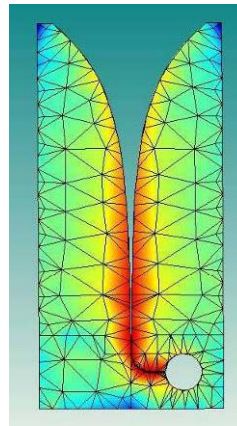
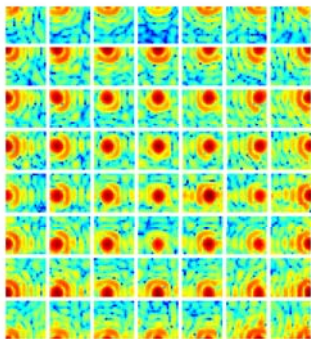


Recent APERTIF Results

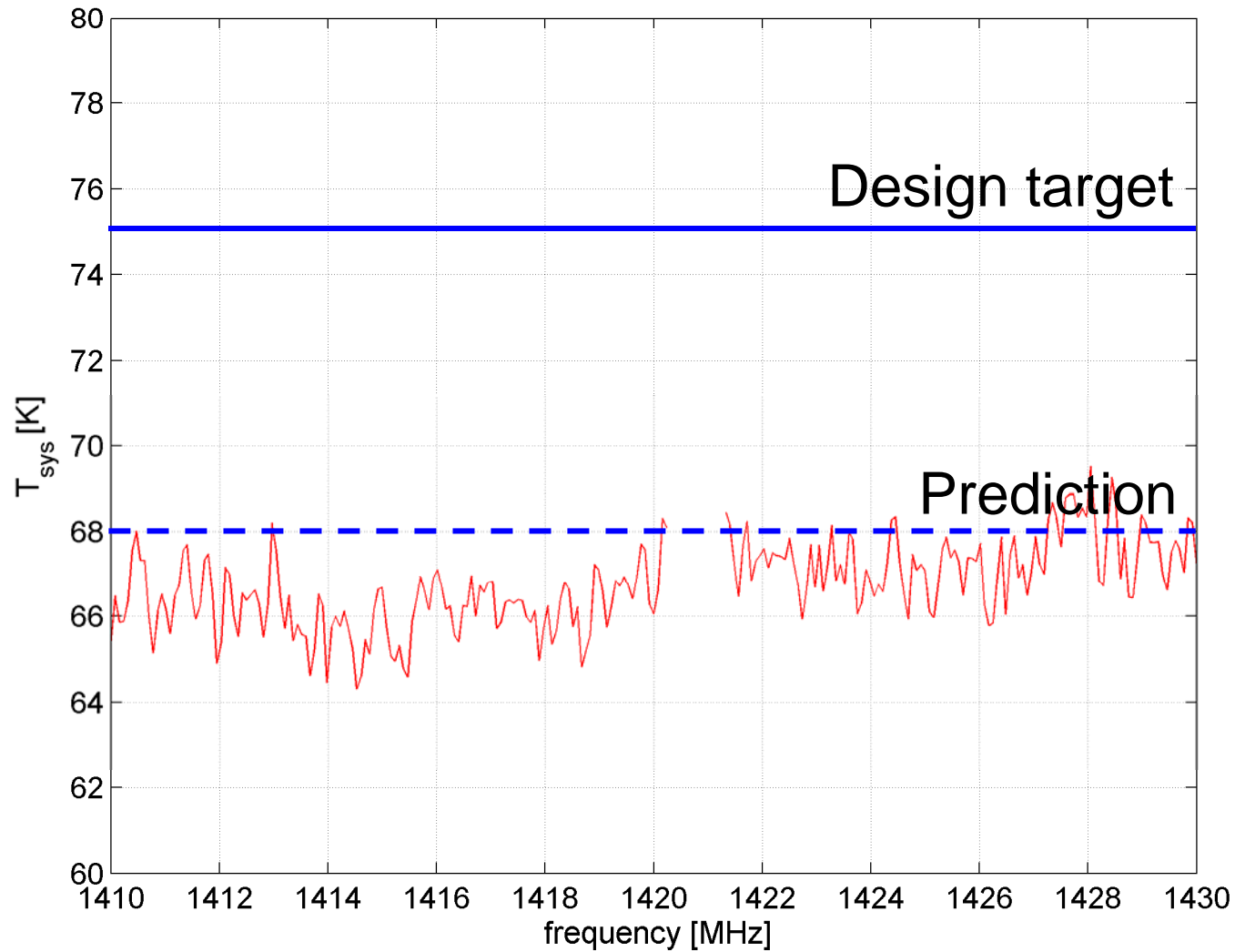
- Upgraded antenna array in WSRT dish
 - Measured $T_{\text{sys}}/\eta = 91 \text{ K}$, $T_{\text{sys}} \sim 68 \text{ K}$
 - Excellent agreement between simulated and measured sensitivity
 - On planned path to $T_{\text{sys}}=55 \text{ K}$ goal
- Front-end redesigned for low noise
 - Noise due to antenna losses: 4 K
 - LNA integrated on antenna
 - Using commercial ATF-54143 transistor

	Current prototype	New prototype	Final APERTIF
Antenna losses	9	6	6
LNA + second stage	82	40	28
Noise coupling	15	9	8
Spillover	15	10	10
Sky noise	3	3	3
Total			

124 → 68 → 55 K

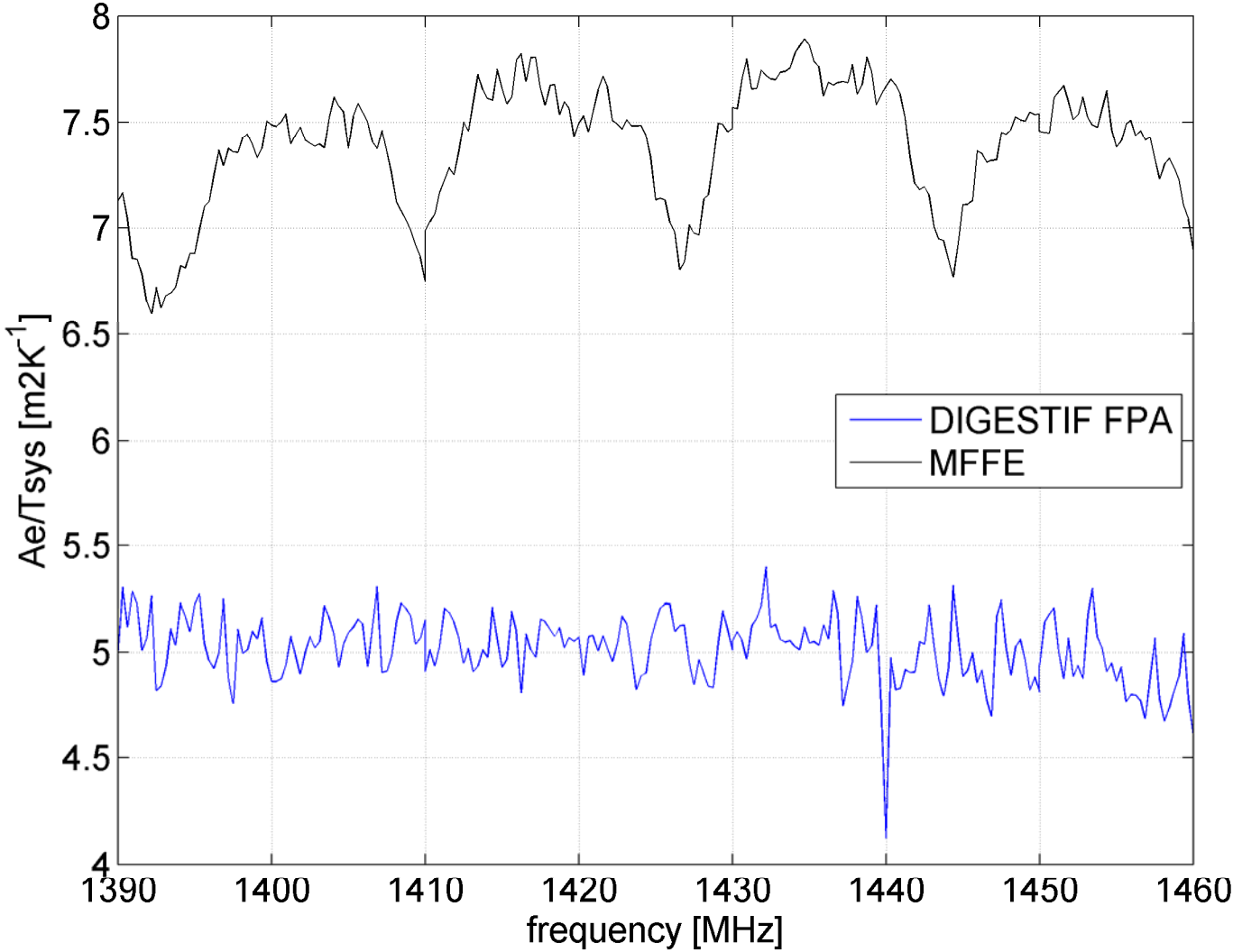


Interferometric measurement on 3C147



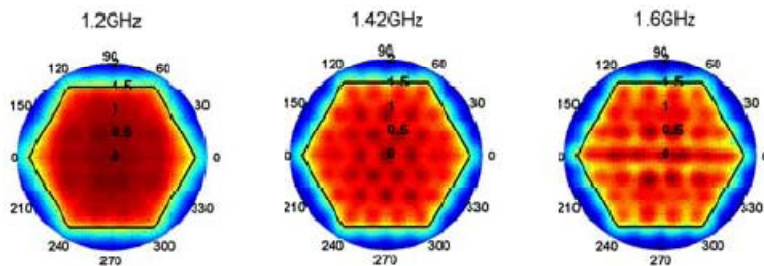
- $T_{\text{env}} = 7^\circ\text{C}$, assuming antenna efficiency of 75%

Reduced feed-reflector interaction

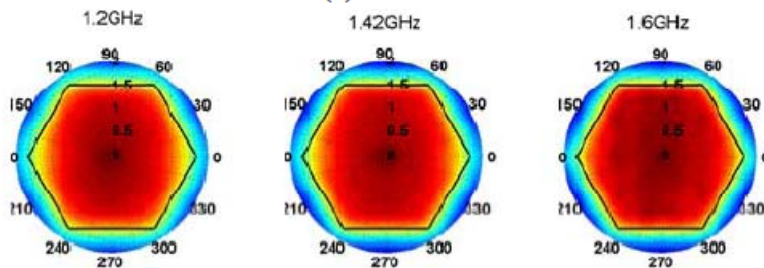


Modeling

- Complete EM + circuit system simulation of PAF
- Evaluate different beamforming schemes:
 - Shape beam (e.g. more circular)
 - Smooth sensitivity over FoV
 - Reduced cross-pol



(a) MaxSNR.



(b) MaxSNR&Constr.

