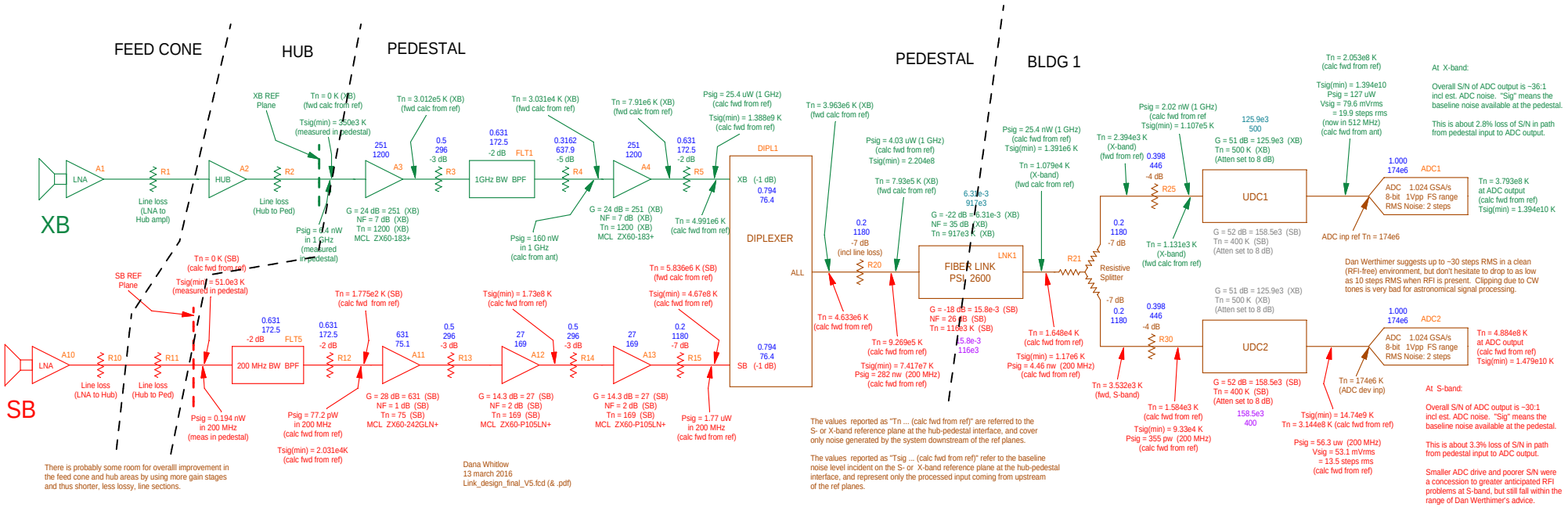
FEED CONE
HUB
PEDESTAL
PEDESTAL
BLDG 1
XB
SB
LNA
HUB
1GHz BW BPF
DIPLEXER
FIBER LINK
PSI 2600
Resistive
Splitter
UDC1
UDC2
200 MHz BW BPF
ADC 1.024 GSA/s
8-bit 1Vpp FS range
RMS Noise: 2 steps
XB REF
Plane
SB REF
Plane
Line loss
(LNA to
Hub ampl)
Line loss
(Hub to Ped)
Line loss
(LNA to Hub)
Line loss
(Hub to Ped)
Psig = 0.194 nW
in 200 MHz
(meas in pedestal)
Psig = 77.2 pW
in 200 MHz
(calc fwd from ref)
Tsig(min) = 2.031e4K
(calc fwd from ref)
Psig = 1.77 uW
in 200 MHz
(calc fwd from ref)
Psig = 160 nW
in 1 GHz
(calc from ant)
Tn = 4.633e6 K
(calc fwd from ref)
Tn = 9.269e5 K
(calc fwd from ref)
Tsig(min) = 7.417e7 K
Psig = 282 nw (200 MHz)
(calc fwd from ref)
Tn = 1.648e4 K
(calc fwd from ref)
Tsig(min) = 1.17e6 K
Psig = 4.46 nw (200 MHz)
(calc fwd from ref)
Tn = 3.532e3 K
(fwd, S-band)
Tn = 1.584e3 K
(calc fwd from ref)
Tsig(min) = 9.33e4 K
Psig = 355 pw (200 MHz)
(calc fwd from ref)
Tn = 1.131e3 K
(X-band)
(fwd calc from ref)
Tn = 174e6 K
(ADC dev inp)
Tsig(min) = 14.74e9 K
Tn = 3.144e8 K (calc fwd from ref)
Psig = 56.3 uw (200 MHz)
Vsig = 53.1 mVrms
= 13.5 steps rms
(calc fwd from ref)
ADC inp ref Tn = 174e6
Tn = 2.053e8 K
(calc fwd from ref)
Tsig(min) = 1.394e10
Psig = 127 uW
Vsig = 79.6 mVrms
= 19.9 steps rms
(now in 512 MHz)
(calc fwd from ant)
Tn = 3.793e8 K
at ADC output
(calc fwd from ref)
Tsig(min) = 1.394e10 K
Tn = 4.884e8 K
at ADC output
(calc fwd from ref)
Tsig(min) = 1.479e10 K
At X-band:
Overall S/N of ADC output is ~36:1
incl est. ADC noise. "Sig" means the
baseline noise available at the pedestal.
This is about 2.8% loss of S/N in path
from pedestal input to ADC output.
Dan Werthimer suggests up to ~30 steps RMS in a clean
(RFI-free) environment, but don't hesitate to drop to as low
as 10 steps RMS when RFI is present. Clipping due to CW
tones is very bad for astronomical signal processing.
At S-band:
Overall S/N of ADC output is ~30:1
incl est. ADC noise. "Sig" means the
baseline noise available at the pedestal.
This is about 3.3% loss of S/N in path
from pedestal input to ADC output.
Smaller ADC drive and poorer S/N were
a concession to greater anticipated RFI
problems at S-band, but still fall within the
range of Dan Werthimer's advice.
The values reported as "Tn ... (calc fwd from ref)" are referred to the
S- or X-band reference plane at the hub-pedestal interface, and cover
only noise generated by the system downstream of the ref planes.
The values reported as "Tsig ... (calc fwd from ref)" refer to the baseline
noise level incident on the S- or X-band reference plane at the hub-pedestal
interface, and represent only the processed input coming from upstream
of the ref planes.
There is probably some room for overalll improvement in
the feed cone and hub areas by using more gain stages
and thus shorter, less lossy, line sections.
Dana Whitlow
13 march 2016
Link_design_final_V5.fcd (& .pdf)