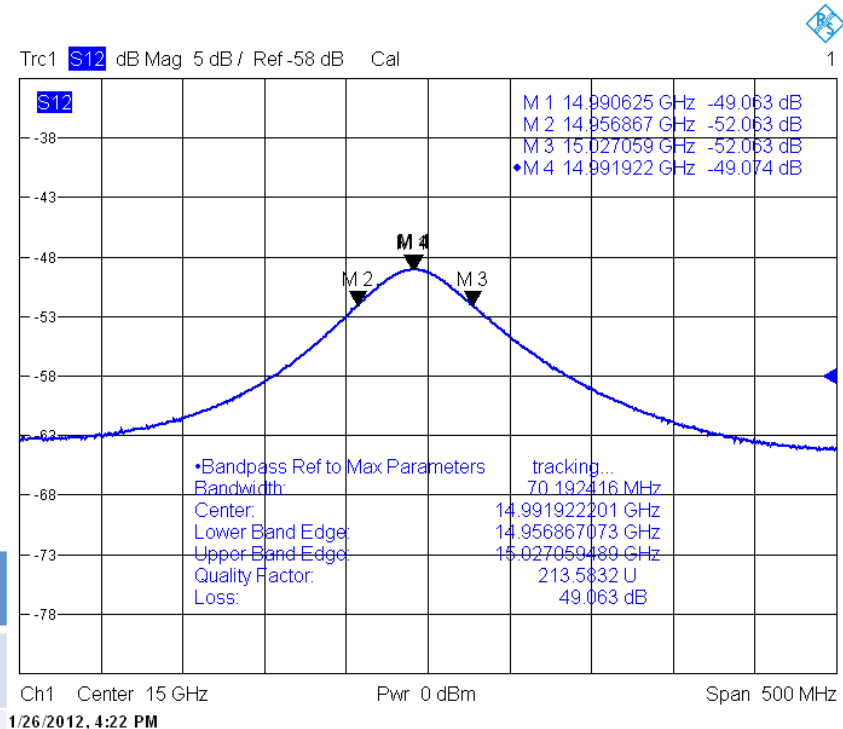
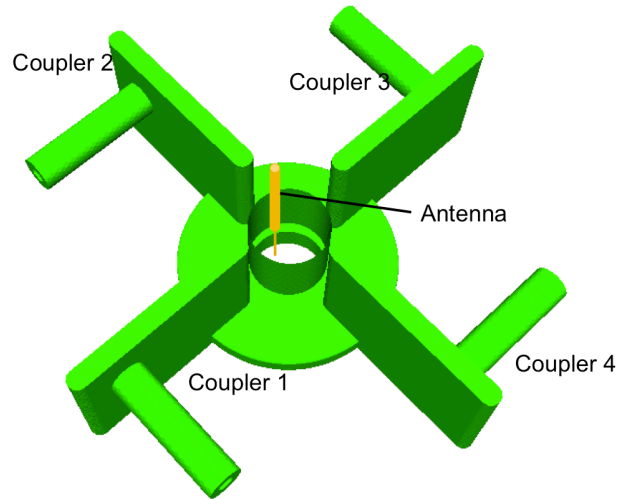


Prototype Cavity BPM Measurements and Electronics

F. Cullinan[†] , S.T. Boogert, N. Joshi, A. Lyapin, JAI at Royal Holloway, Egham, UK
Eva Calvo, Franck Guillot-Vignot, Thibaut Lefevre, Lars Soby, CERN, Geneva
Andrei Lunin, Manfred Wendt, Vyacheslav P. Yakovlev, Fermilab, Batavia
Stephen Smith, SLAC, Menlo Park, California

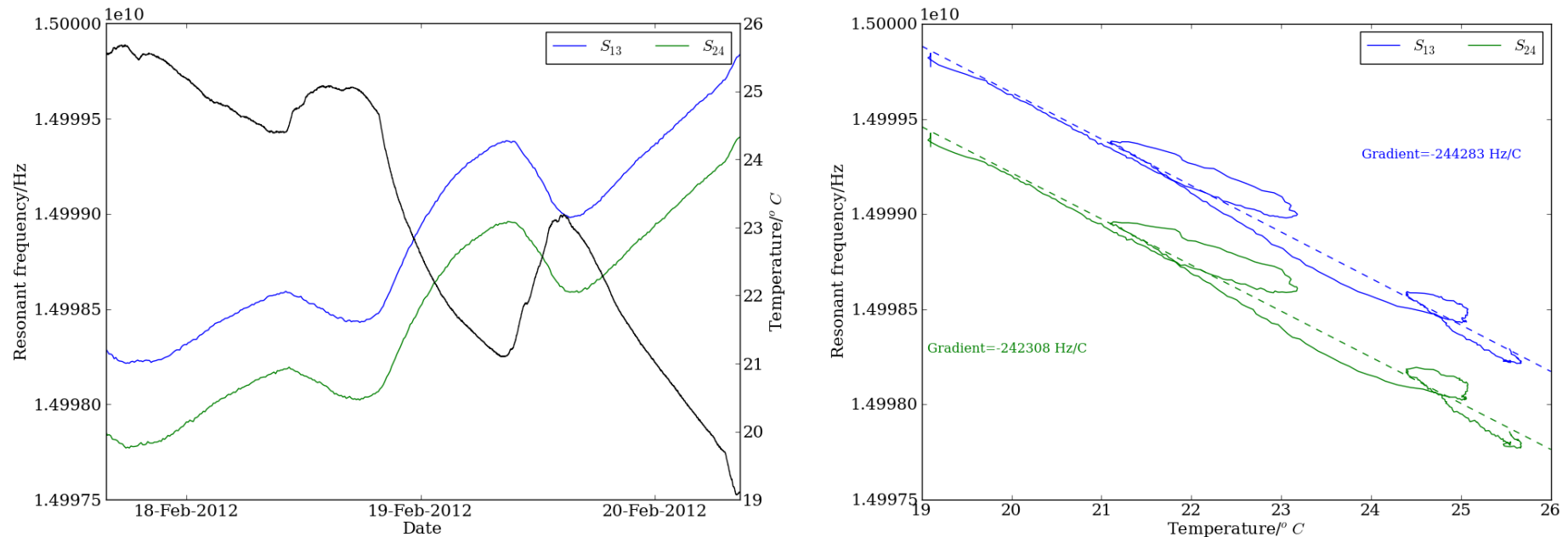
RF Measurements



Parameter	Measured	Predicted
f_0 /GHz	14.993	14.990
Q_L	224	270
Q_0	304	450

- Mode excitation using weakly coupled antenna
- Q-value slightly lower than predicted – surface roughness, imperfect electrical contacts
- Otherwise good agreement with simulation before brazing

Temperature Stability



Close to expected, $\alpha_L = 16.5e-6 \text{ } ^\circ\text{C}^{-1}$ (thermal expansivity of stainless steel)

$$\frac{df}{dT} = f \cdot \alpha_L = 248 \text{ kHz } ^\circ\text{C}^{-1}$$

- Cavity left over one weekend – plenty of variation in ambient temperature
- Clear anti-correlation with frequency
- Hysteresis visible – must use probe attached to cavity material
- Must be repeated with reference cavity

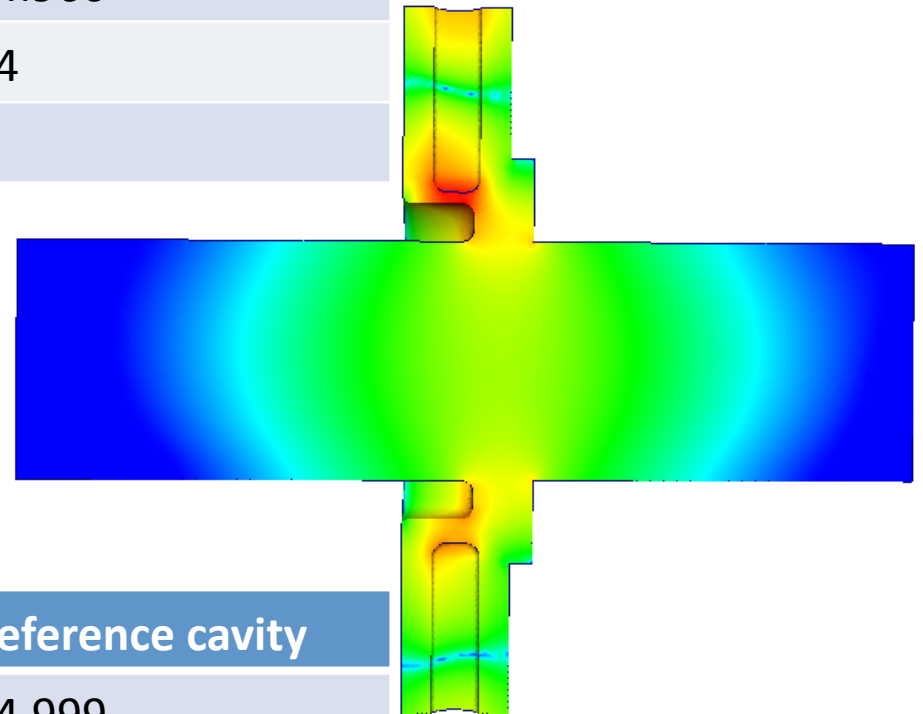
After Modification and Brazing

Reference cavity modification

Parameter	Before	After
f_0/GHz	16.940	14.960
Q_L	153	74
Q_0	343	-

Effect of no spacer simulated:

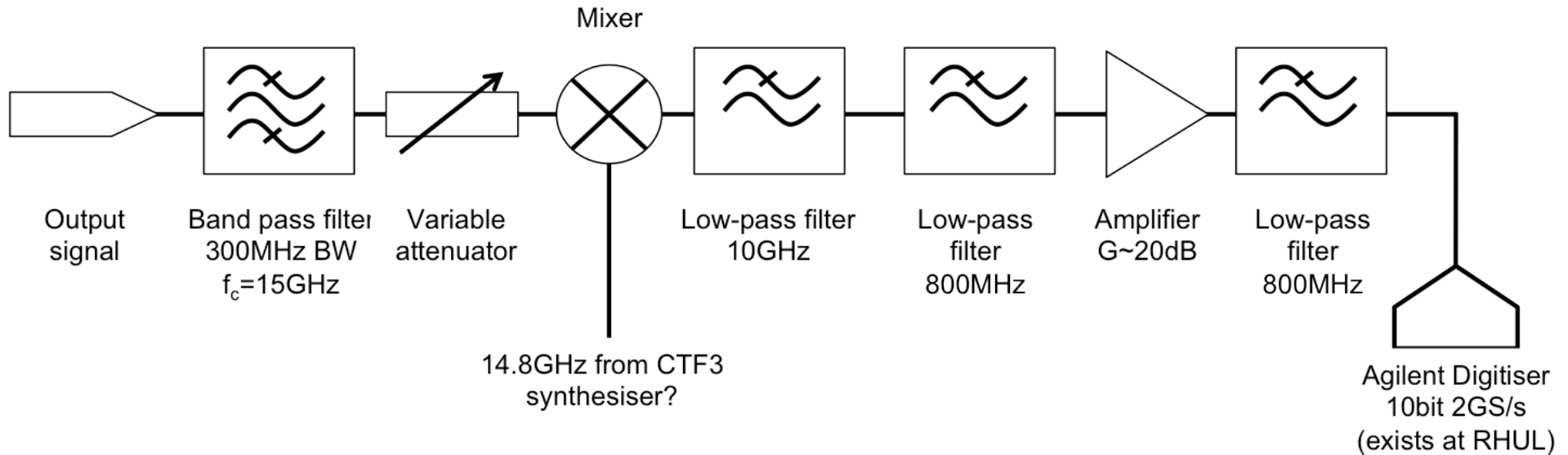
- Frequency reduced by 33MHz
- Q_L reduced by a factor of 2



After brazing

Parameter	Position cavity	Reference cavity
f_0/GHz	15.011	14.999
Q_L	198 (224)	130
Q_0	292 (304)	190

Electronics

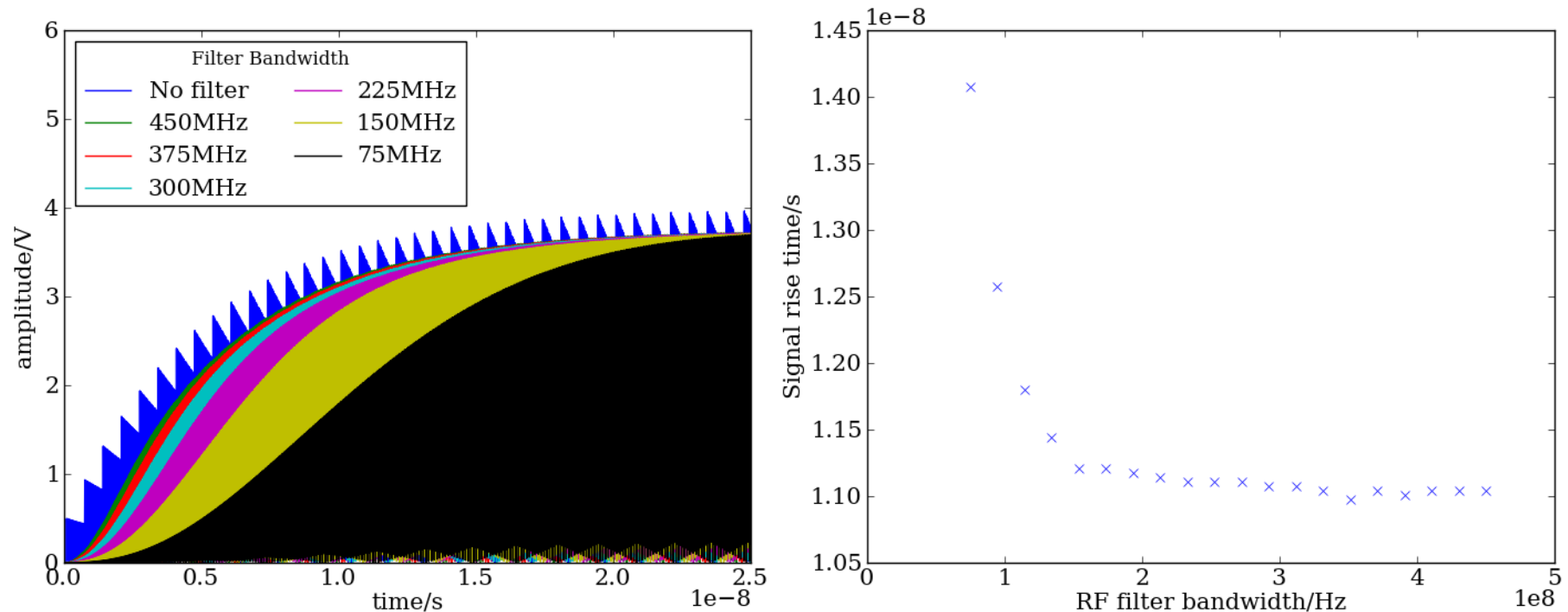


- Simple for first test – connectorised components
- Mixer chosen for high linearity
- IF filters chosen for high stop-band attenuation in desired frequency range
- 2Gs/s 4-channel, Agilent acquiris digitiser – 10 bit, cPCI
- Variable attenuator RS232 interfaced micro-controller



Electronics Bandwidth

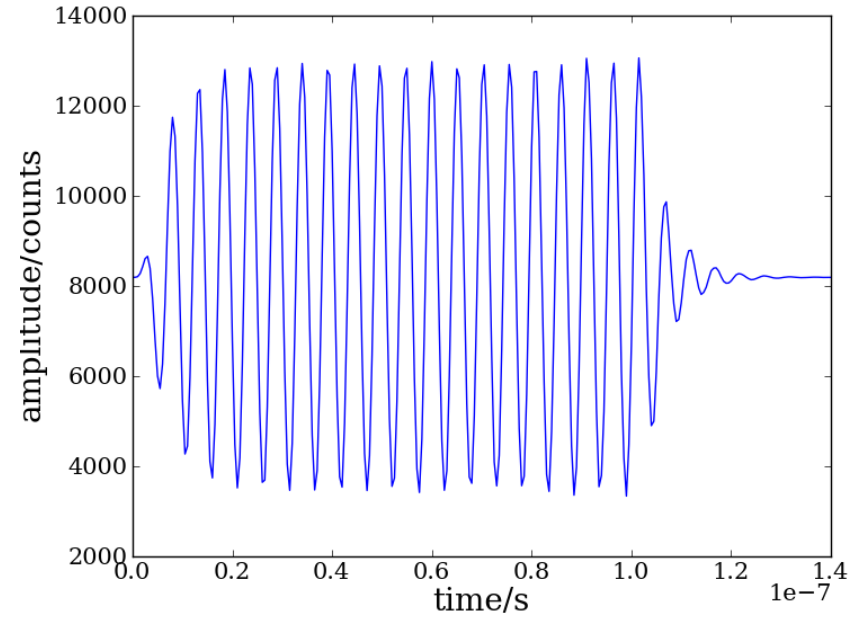
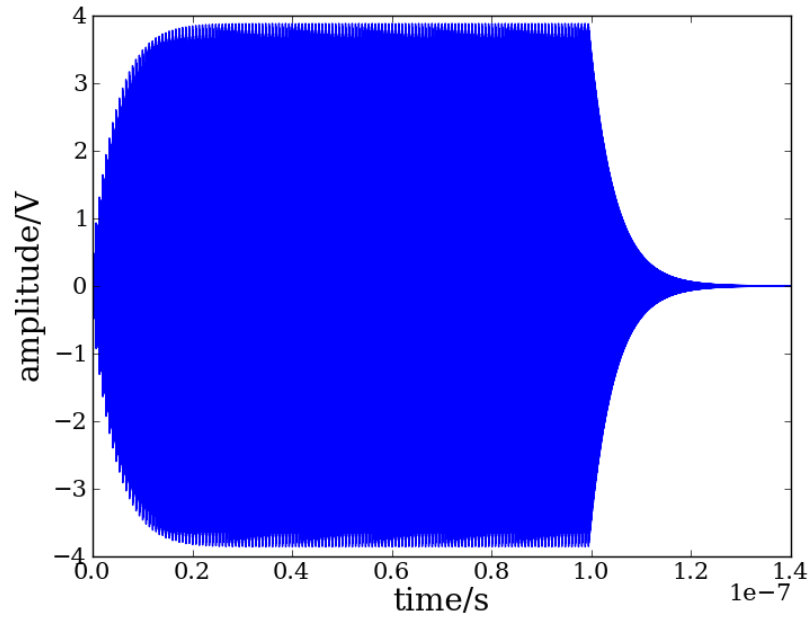
Maximum bunching frequency at CTF3: 1.5GHz, closest to CLIC: 2GHz



- Multibunch signal rise time affected if bandwidth too small
- May not be able to filter noise outside of Nyquist band with lower sampling rate

Signal Processing

Single offset (1mm) bunch train, no timing or charge jitter, 150 bunches



Need to work out signal processing scheme that deals with the closely spaced bunches and delivers the time resolution of 50ns