

FOLLOW-UP FOR THE TCDQ & TCDS & TDI concerning the RF fingers

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- ◆ **Email sent to Wim Weterings, Brennan Goddard and Volker Mertens (cc Verena Kain, Oliver Aberle, Oliver Bruning, Alexej Grudiev, Jacques Lettry) on 25/09/06**

TCDQ

Simulations by Alexej Grudiev => Longitudinal Broad-Band geometrical impedance $Z/n = 0.36$ mohm (from the 4 tapered transitions) + 0.66 mohm (from the 22 gaps of 1 mm) = 1.02 mohms. This is published in a LHC note. We can trust these values as we believe we simulated the main component of the impedance, i.e. ~ pure geometrical. By putting RF fingers we can eliminate the 0.66 mohm. This was said to be not absolutely necessary for the longitudinal (transverse) impedance, as it is ~1% (2%) of the LHC budget and it was believed to be difficult to install RF fingers. I think at that time the beta function was not taken into account => One should multiply this value by 7 to take it into account, leading to ~ 15% of the total transverse Broad-Band impedance budget. Therefore, and for this reason, I would (have) recommend(ed) to install RF fingers if possible.

TCDS

Simulations by Alexej Grudiev => Longitudinal Broad-Band geometrical impedance $Z/n = 0.24$ mohm ($= 4 * 0.06$ due to the 4 tapered transitions). The impedance of the 1 mm gaps (22? as for the TCDQ??) is much smaller than for the TCDQ due to the larger half gap (~ 3 times the one of the TCDQ). This is also published in a LHC note. Therefore, we do not push too much to install RF fingers in this case, but of course it is better if you can do something.

TDI

Measurements by Fritz Caspers and Tom Kroyer (after some simulations by Alexej) $\Rightarrow Z/n = 14 \text{ mOhms}$, and $Z_y \approx 2 \text{ MOhms/m}$. As it is the measured (total) impedance, it is the sum of the geometrical and resistive parts. Therefore, we don't know from these measurements the Broad-Band impedance of the 5 mm and 1 mm gaps alone, and therefore we don't know exactly what will be reduced with the RF fingers. But one can anticipate that the gaps should contribute much more than the 2% computed for the TCDQ $\Rightarrow \sim 20\%$. Furthermore, $\beta_{\text{ax}} = 50 \text{ m}$, i.e. it is slightly smaller than the average value (70 m), and therefore the impedance has to be multiplied by ~ 0.7 . So, for the TDI, we would also (have) recommend(ed) to put RF fingers.

Reminder on the LHC Broad-Band impedance budget

	Z/n (mOhms)	Z_t (MOhms/m)
- Inj:	70	1.35
- Top:	76	2.67