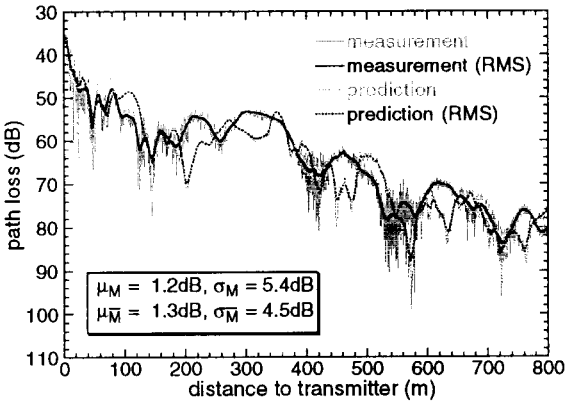

Fig. 5. Comparison of measurement and simulation at f_{DCS} = 1853.4MHz, running RMS window length: $60\lambda_0$ (left transmitting antenna in Fig. 3)

mean errors ($\mu_{\bar{M}}$ = 1.8dB in Fig. 4 and $\mu_{\bar{M}}$ = 1.3dB in Fig. 5) and standard deviations ($\sigma_{\bar{M}}$ = 3.6dB in Fig. 4 and $\sigma_{\bar{M}}$ = 4.5dB in Fig. 5) emphasize the good performance of the model, especially bearing in mind the imprecise assignment of the absolute measurement location (cf. section II-A).

B. Influence of curves on the simulation accuracy

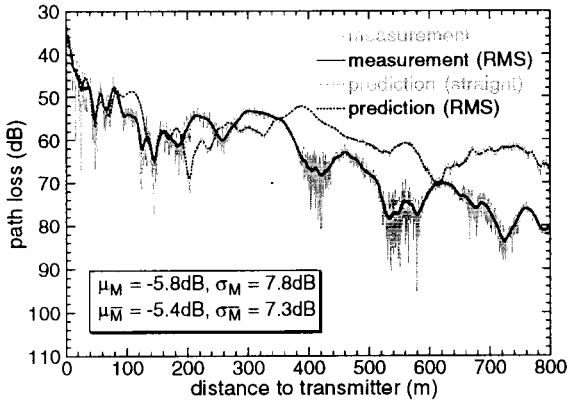

Fig. 6. Comparison of measurement and simulation of Fig. 5, but assuming a fictitious straight tunnel course for the simulation

In order to determine the influence of curves on the propagation behaviour, the same measurements as depicted in Fig. 5 (scenario at f_{DCS} = 1853.4MHz) are compared with simulations, where the bend of the tunnel is approximated by a straight line. Compared to the simulation of the actual curved course in Fig. 5, one can clearly distinguish the deviation of the prediction from the measurement in Fig. 6. For distances $d > 350$m, the deviation becomes noticeable, which is the region where the left bend of the tunnel starts. Although the radius of curvature of the left bend is as large as r_{cs} = 850m, the deviation is rather significant. The predicted mean level is increased by 7dB and the standard deviation is almost doubled. This example shows the importance of an adequate modelling of a tunnel's curvature, being possible by the RDN-based techniques [1].

C. Influence of the cross-sectional shape on the simulation accuracy

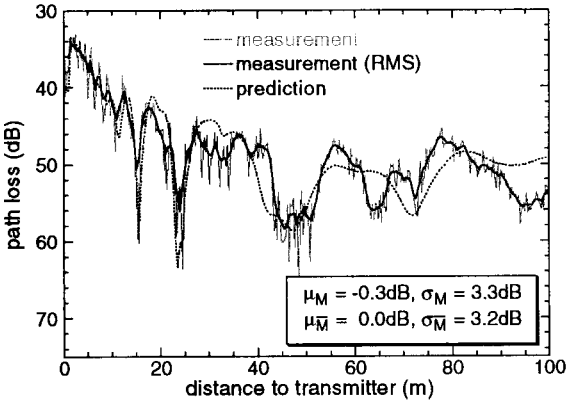

Fig. 7. Comparison of measurement and simulation with arched cross section, parameters according to Fig. 5, f_{DCS} = 1853.4MHz, running RMS window length: 1m (re-plot of Fig. 5 on the first 100m)

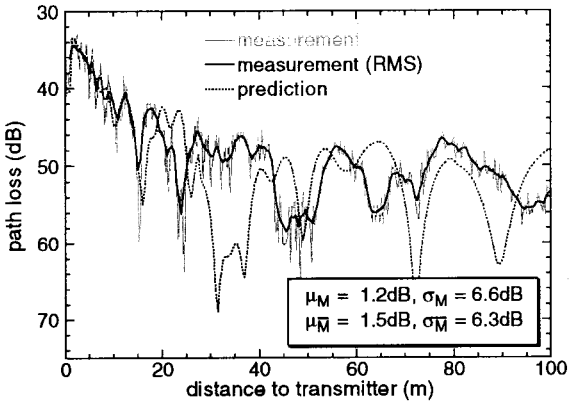

Fig. 8. Comparison of measurement and simulation with circular cross section, parameters according to Fig. 5, f_{DCS} = 1853.4MHz, running RMS window length: 1m

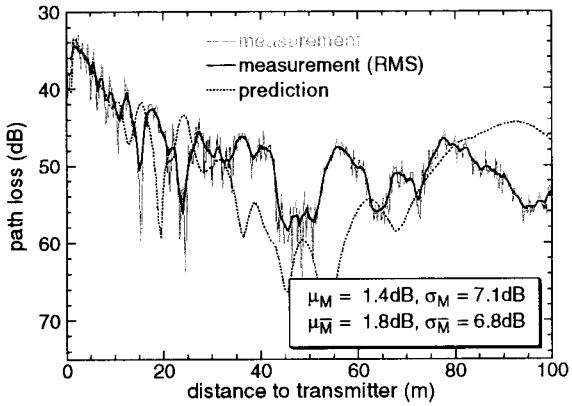

Fig. 9. Comparison of measurement and simulation with rectangular cross section, parameters according to Fig. 5, f_{DCS} = 1853.4MHz, running RMS window length: 1m

It is commonly assumed that the actual shape of the cross section is of minor influence on the propagation behaviour in a tunnel, as long as its actual cross-sectional area is preserved [3], [4]. Figures 7, 8 and 9