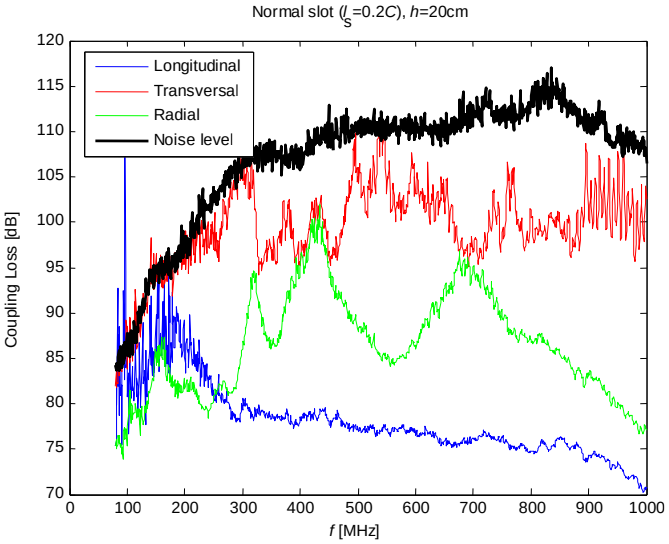
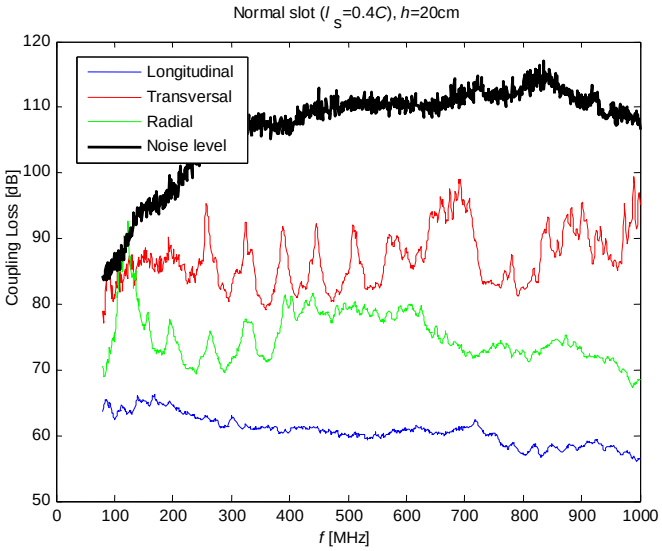
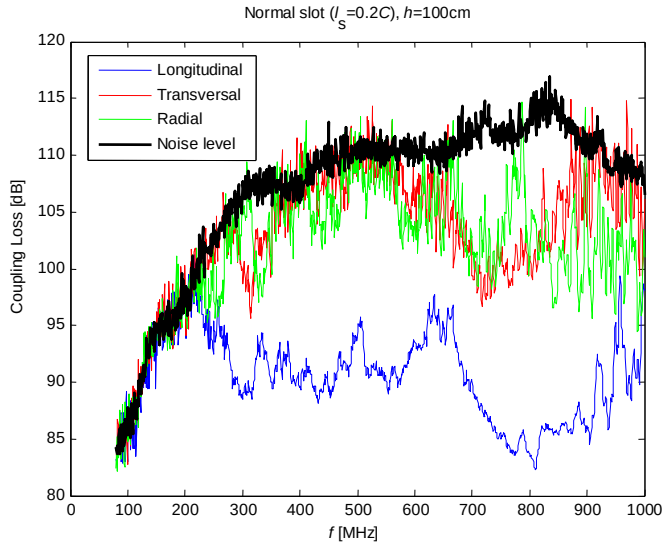
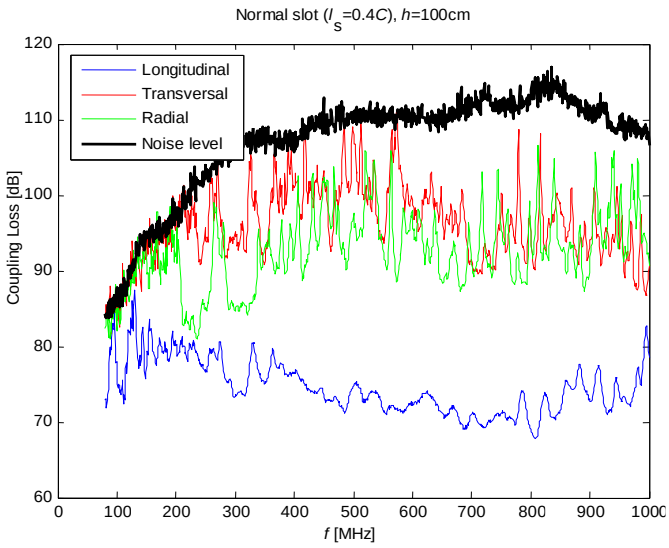
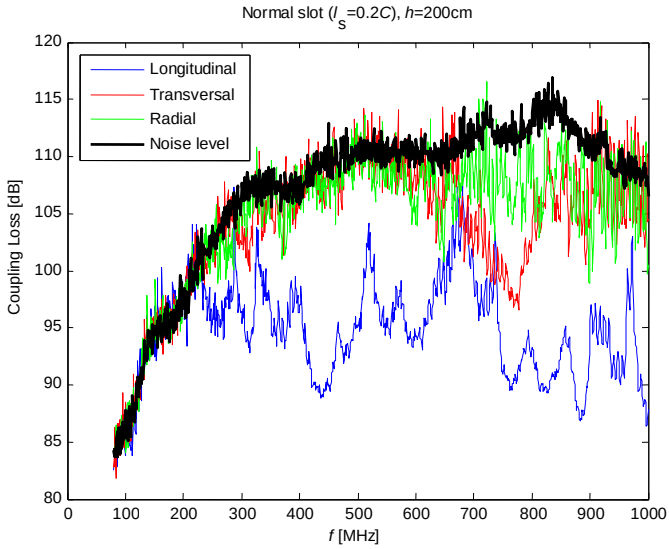










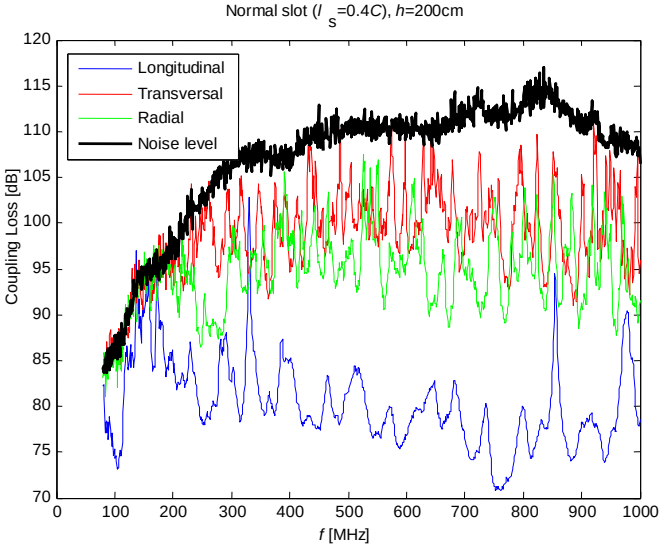
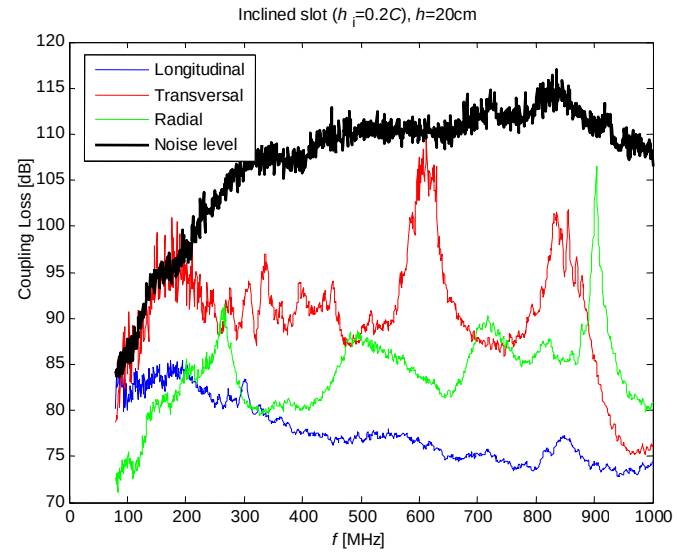
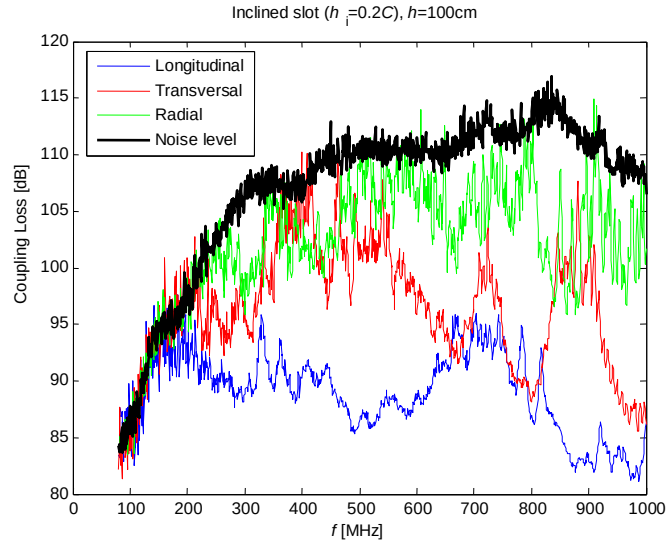


Fig. 6. Coupling loss frequency dependence at specific heights, for normal slot, l_S=0.2C (lower coupling loss is better, in all figures)

Fig. 7. Coupling loss frequency dependence at specific heights, for normal slot, l_S=0.4C





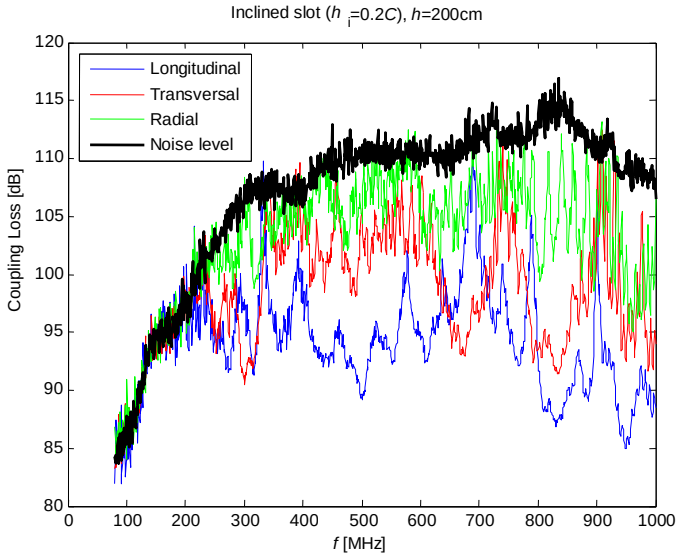
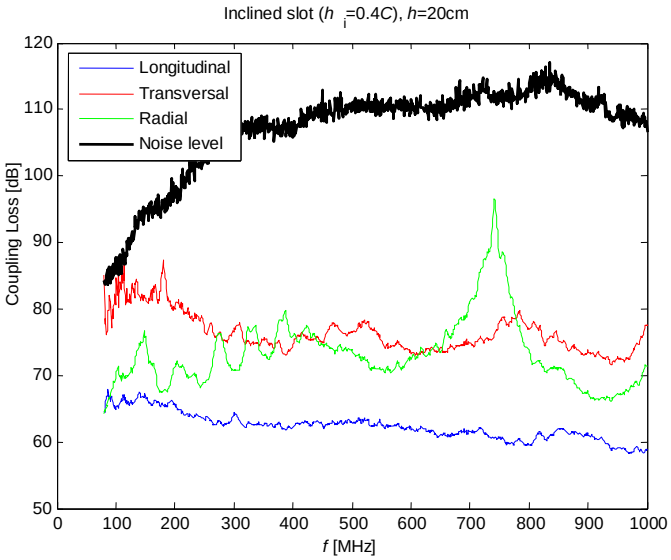
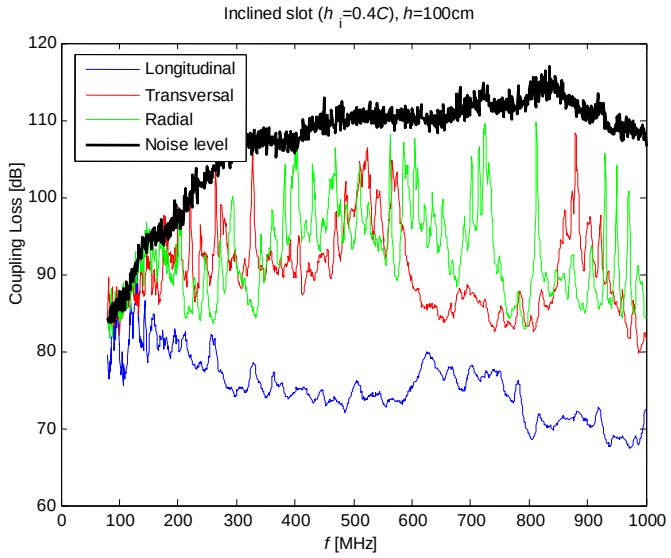


Fig. 8. Coupling loss frequency dependence at specific heights, for inclined slot, h_i=0.2C





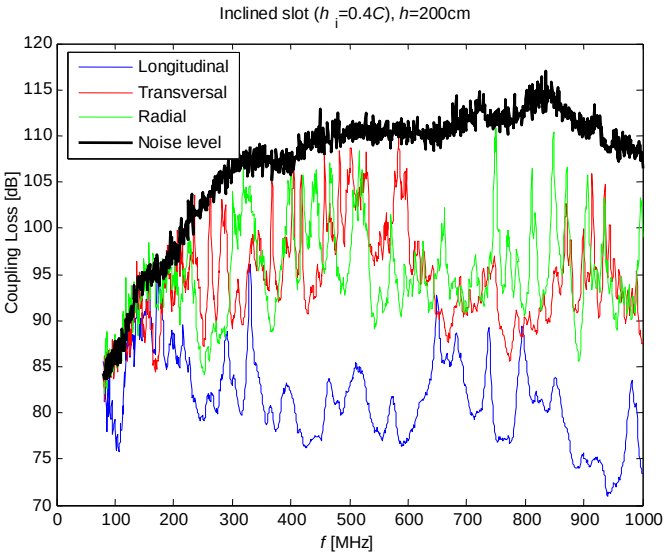


Fig. 9. Coupling loss frequency dependence at specific heights, for inclined slot, h_i=0.4C

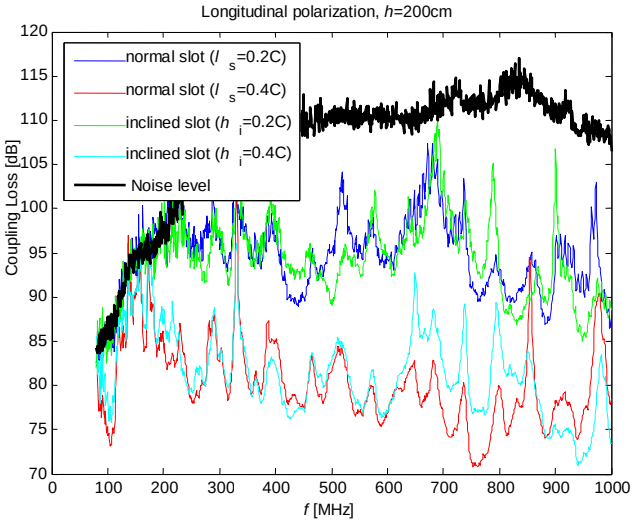


Fig. 10. Coupling loss frequency dependence, longitudinal polarization, height h=2 m, for different slots

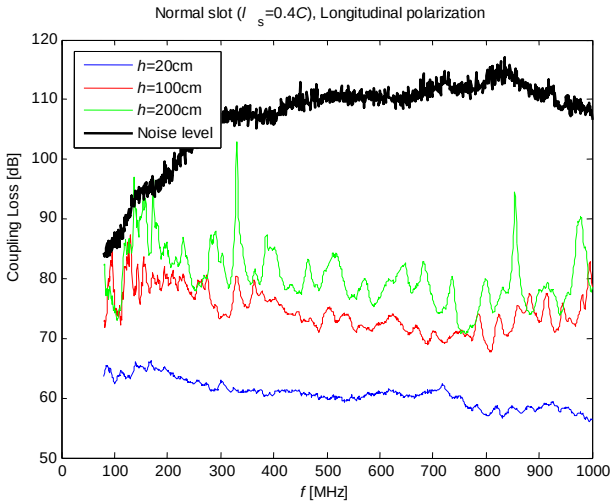


Fig. 11. Coupling loss frequency dependence, longitudinal polarization, normal slot, l_S=0.4C, for three different heights

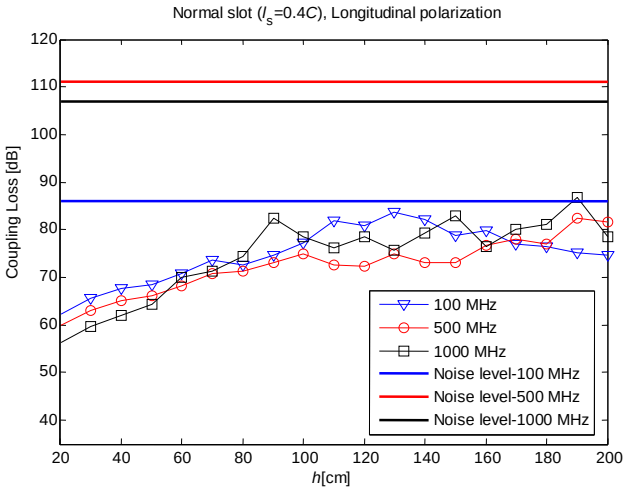
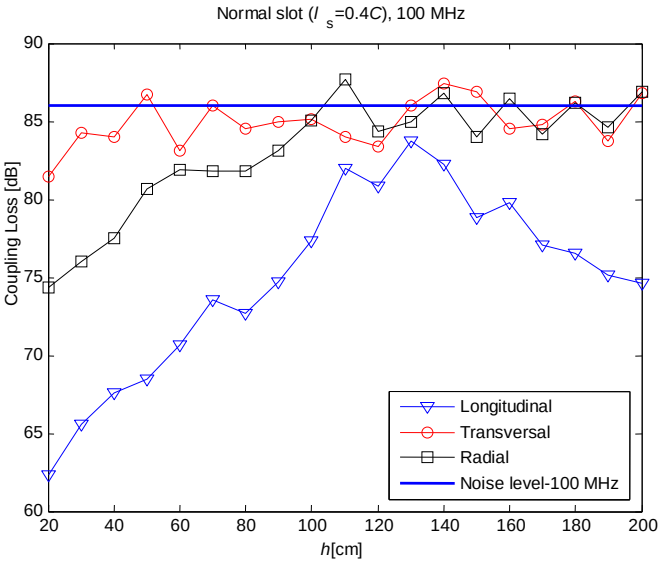
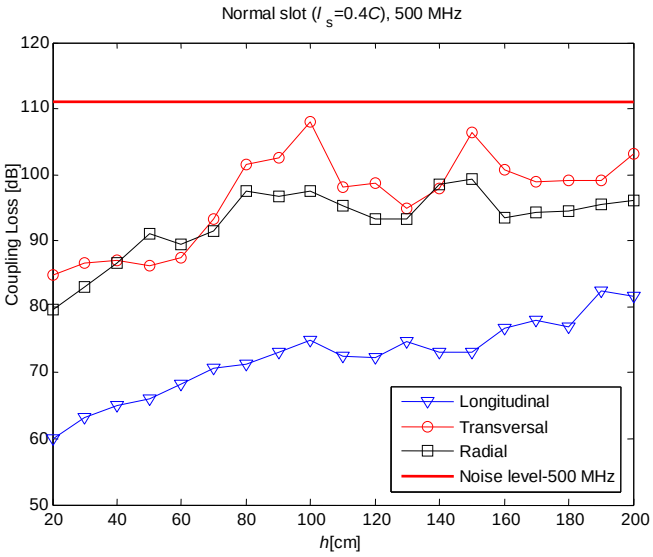


Fig. 12. Coupling loss profiles for the longitudinal polarization, normal slot, l_S=0.4C, for three different frequencies





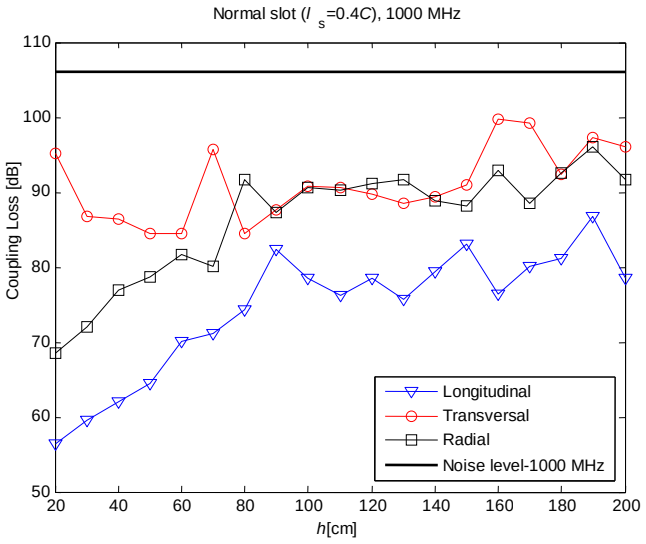


Fig. 13. Coupling loss profiles for all three polarizations, normal slot, l_S=0.4C, for three different frequencies

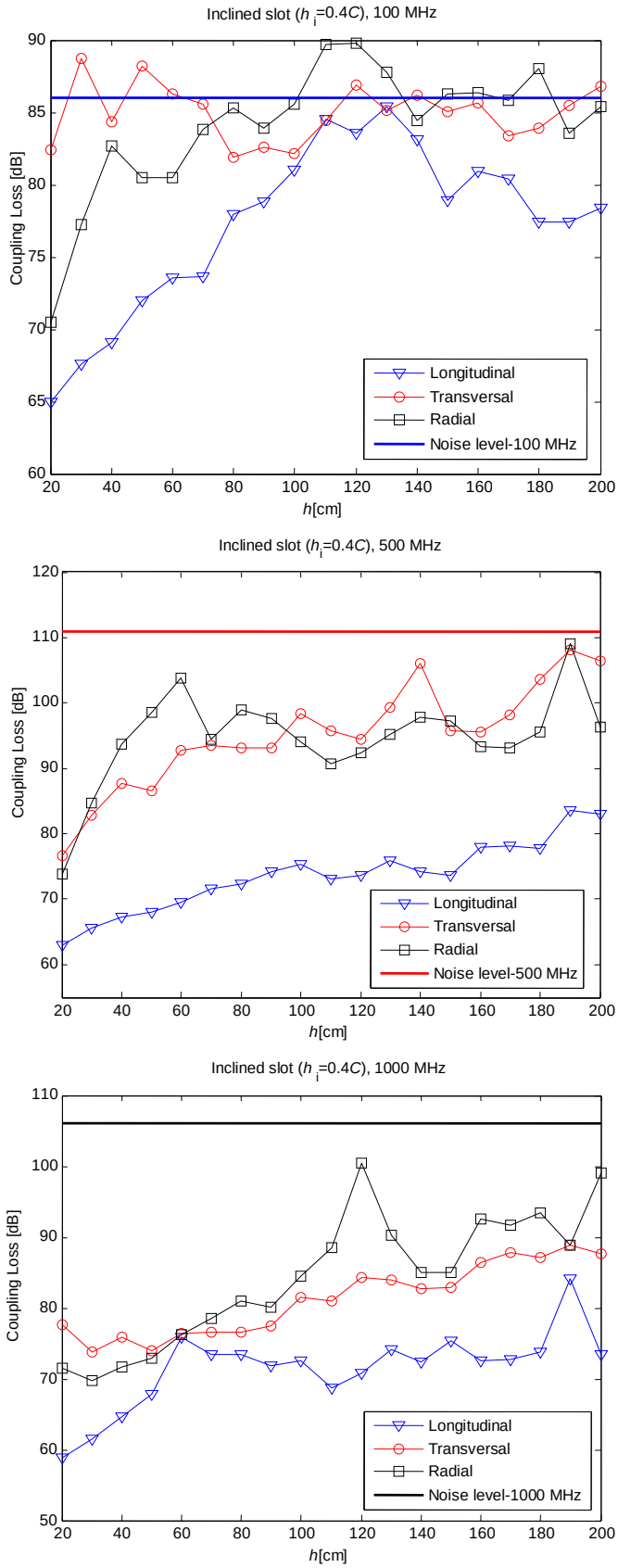


Fig. 14. Coupling loss profiles for all three polarizations, inclined slot, h_i=0.4C, for three different frequencies

For the full insight into the measurement results, the 3D graphs of the mean coupling loss, calculated using (11), for all frequencies, heights and slot embodiments, are presented in Fig. 15.

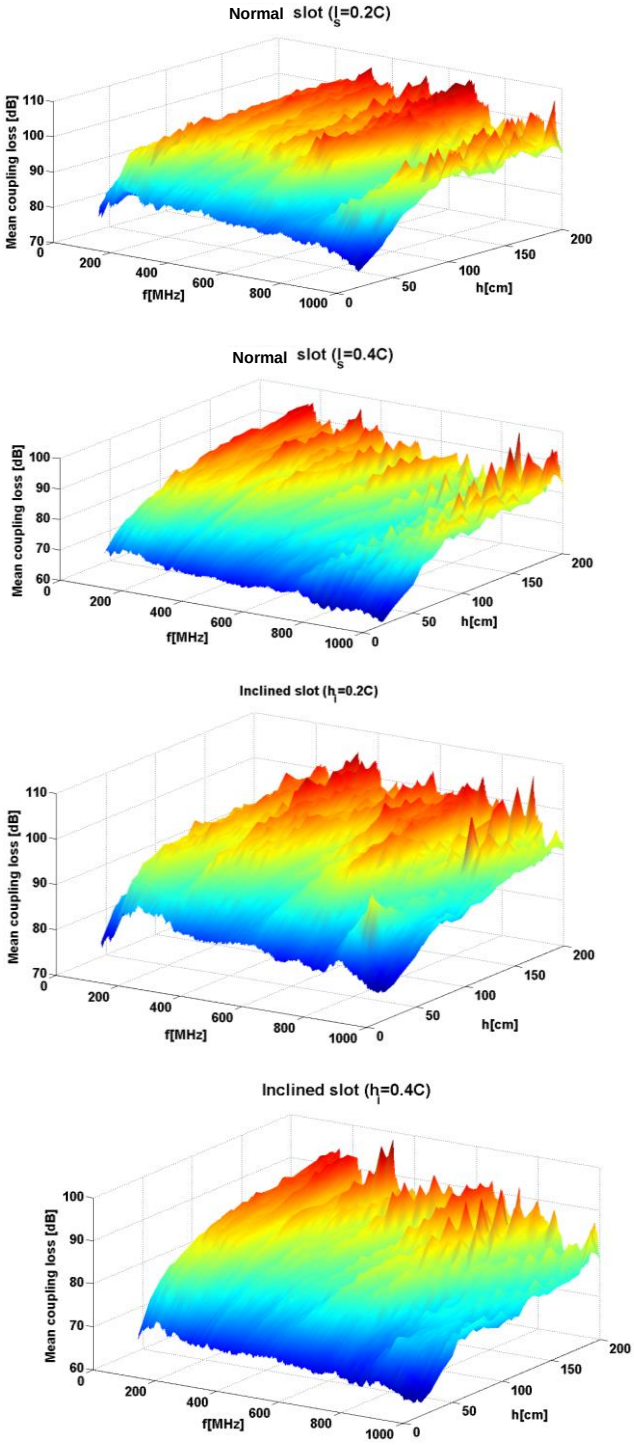


Fig. 15. Mean coupling loss for all slot types

IV. Concluding Remarks

A single slot in a coaxial cable shield is a variation of the slot antenna, and can be used both for transmitting EM waves from the cable, and receiving EM waves into the cable. Cables having a large number of periodically arranged slots are commonly used as distributed antennas, so called "leaky cables". Understanding of a single slot radiation is therefore important for the understanding of a leaky cable behavior.

This study consisted of coupling loss measurements for four different embodiments of a single slot in a coaxial cable shield. The slot length and inclination with respect to the cable axis were varied.

According to the results, the strongest electric field polarization was the one longitudinal to the cable axis. This can be explained by the fact that the slot was oriented normal to the cable axis, thus cutting the longitudinal current flow, breaking the longitudinal current lines and creating the potential difference between the opposite edges of the narrower slot dimension.

Inclining the slot with respect to the cable axis did not yield any major changes for the dominant longitudinal polarization, as long as the length of the slot (measured in the cross-section projection of the slot) remained unchanged. On the other hand, the other two orthogonal polarizations gained several dB from the slot inclination, which could be important for communication between the cable and an arbitrarily polarized antenna.

The most dramatic effect occurred as the consequence of extending the length of the slot by a factor of 2, from 20% to 40% of the shield circumference. This yielded a 20 dB increase of the radiated fields, resulting with 20 dB lower coupling loss. Hence the slot length plays a major factor in designing the slot.

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Antonio Šarolić received the Diploma Engineer, MS and PhD degrees in Electrical Engineering in 1995, 2000 and 2004 from the University of Zagreb, Croatia. He was employed at the same university from 1995 to 2005, at the Faculty of Electrical Engineering and Computing (FER), Dept. of Radiocommunications. In 2006 he joined the University of Split, FESB, Department of Electronics and is now Associate Professor in Electrical Engineering. His areas of interest are electromagnetic measurements, bioeffects of EM fields, electromagnetic compatibility (EMC) and radiocommunications.

Zlatko Živković received the Diploma Engineer and PhD degrees in Electrical Engineering in 2007 and 2014 from the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, University of Split, Croatia.
He is currently a postdoc assistant at the University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB), Department of Electronics. His research interests are: electromagnetic measurements, bioeffects of EM fields, electromagnetic compatibility (EMC) and radiocommunications.

Damir Senić received the M.Sc. degree in 2008 and Ph.D. degree in 2014, both from University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, Split, Croatia. He is currently with University of Colorado Boulder working at National Institute of Standards and Technology, Communications Technology Laboratory in Boulder as a Postdoctoral Research Associate through Professional Research Experience Program. His research interests include millimeter wave radiocommunications, electromagnetic measurements, electromagnetic compatibility (EMC) and bioeffects of EM fields. Dr. Senic received Richard E. Merwin Award of IEEE Computer Society for exemplary involvement in IEEE activities and excellent academic achievement in 2013.

Niko Ištuk received the M.Sc degree in Communication and Information Technology in 2013 from University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, Split, Croatia. He is an EMC Engineer within the STRIPmed project team (Strengthening the capacity of University of Split for research, development and innovation in medical neuroelectronics) at the Speech and Hearing Research Lab, School of Medicine, University of Split, Split (Croatia).