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**Access, Terminals, Transmission and Multiplexing (ATTM);
Access network xDSL splitters for European deployment;
Part 3: Generic specification of static distributed filters for xDSL over POTS**

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM).

The present document is part 3 of a multi-part deliverable covering Access network xDSL transmission filters, as identified below:

Part 1: "Generic specification of xDSL over POTS splitters";

Part 2: "Generic specification of xDSL over ISDN splitters and xDSL universal splitters";

Part 3: "Generic specification of static distributed filters for xDSL over POTS";

Part 4: "Additional specifications for dynamic distributed filters for xDLS over POTS (under study)".

NOTE 1: The present document is derived from previous specifications of distributed filters for ADSL over POTS. Before the publication of the 3 (or 4) parts as described above, the TS 101 952 was composed of 2 parts, which discriminated between ADSL and VDSL, with several subparts. For reasons of simplicity the TS is now restructured as a set of only 3 (potentially 4) documents, intended for both ADSL and VDSL when applicable. The older structure of the documents is explained in the informative Annex B.

NOTE 2: Useful information on splitter tests also applicable to distributed filters may be found in TR 101 953-1-1 [i.3] and TR 101 953-2-1 [i.5]. These documents are linked to the previous versions of the splitter specifications. [i.3] and [i.5] e.g. describe the combination of the AC testing conditions of the test set-ups with the DC conditions controlled via feeding and loading bridges. If there is a discrepancy between the present document and the TR 101 953 series of documents [i.3] to [i.8], the present document prevails.

NOTE 3: The use of distributed filters is not recommended for VDSL, but it is not excluded. For this reason the parts 3 and 4 refer to distributed filters for xDSL and not just for ADSL.

NOTE 4: In the present document we introduce three classes of filters: basic, standard and enhanced. The reasoning behind this approach is clarified in Clause 6.1.1.

NOTE 5: When multiple distributed filters are installed in parallel the quality of the POTS band signals tend to degrade proportionally to the number of filters placed at the customer's premises. This effect is explained in Clause C.1. This degradation effect is worse if multiple distributed filters of basic quality are used, or filters that only fulfil the previous published requirement (TS 101 952-1-5 (V1.2.1) [i.17]). In that case also the DSL signals can potentially be degraded. The latter is further addressed in the informative Annex B.

The present document is fully in line with initiative "eEurope 2002 - An Information Society For All", under "The contribution of European standardization to the eEurope Initiative, A rolling Action Plan" especially under the key objective of a cheaper, faster and secure Internet.

Introduction

Remarks and limitations of the present document.

The present document covers all xDSL system variants, such as ADSL1, ADSL2, ADSL2plus, VDSL1 and VDSL2. It is applicable at only at the Terminal Equipment (TE) (i.e. user) side of the line. There is no equivalent of the distributed filter at the CO side. The CO side central splitter requirements for xDSL over POTS splitters are in TS 101 952-1 [11].

The present document is derived from previous specifications of distributed filters for ADSL over POTS, and it corrects the errors of the older versions as explained in Annex B. It now contains measurements and requirements for the combined effect when multiple distributed filters are deployed in parallel.

A number of limitations and remarks of the present document should be listed:

1) Originally the present document was limited to distributed filters for ADSL. It is now extended to cover also distributed filters for VDSL. In the ITU-T documents a warning note is recommending not to use distributed filters for VDSL. E.g. see note 7 of section 5.4 of G.993.2 [i.13]). However, if distributed filters are used in VDSL2 scenarios to achieve a faster and cheaper deployment of service, operators should realize that this could prevent VDSL to attain its maximum theoretical transmission performances, and that ERM/EMC problems of the VDSL could worsen.

2) The present document covering xDSL over POTS distributed filters was gained from the experience with passive and static DSL splitters, the original state of the art for this application. Therefore, the requirements in the present document are primarily intended for passive and static distributed filters at the TE side only.

3) There are other classes of filters possible, besides passive and static splitters. Such active and/or dynamic filters are composed of other elements than passive components. Active/dynamic splitters require different and additional requirements and test methods to be specified. Indeed, the dynamic behaviour of the splitter could allow the requirements to differ depending on the state of the line, e.g. requiring isolation, attenuation, rejection and insertion loss values to be adapted to the on-hook and the off-hook state of the line. The full specification of requirements for active/dynamic splitter is F.F.S. An introduction to this is in the informative Annex K. Additional requirements might be in TS 101 952-4 [i.14] (under study).

4) Distributed filters have less stringent isolation requirements than central splitters. The non-linearity of some telephone sets may then cause audible back-ground noise in the POTS band, disturbing the phone conversation and potentially even reducing the DSL capacity, particularly when the phone is picked-up.

5) Besides testing static requirements according to the present document, there exists a dynamic testing methodology, compiled by the broadband forum, in TR-127 [i.15]. The TR-127 [i.15] methodology for POTS splitters and filters is now published. A tutorial text on TR-127 [i.15] is given in informative Annex H. The TR-127 [i.15] test methodology is considered a useful method of assessing overall filter performance and could be carried out complementarily to the present specification. For certain properties the TR-127 [i.15] methodology is sometimes the only feasible method at an acceptable complexity. Indeed, TR-127 [i.15] may prove that a filter works correctly in a worst case xDSL test environment, including POTS DC and ringing signals. The use of the TR-127 [i.15] methodology for this purpose is suggested for certain clauses in the present document, but out of scope.

6) The use of Option A and B for defining Return Loss is kept in the present document in exactly the same way as it is used for POTS splitters.