```
<section id="FE_GET_PROPERTY">
<title>FE_GET_PROPERTY/FE_SET_PROPERTY</title>

<section id="isdbt">
        <title>ISDB-T frontend</title>
        <para>This section describes shortly what are the possible parameters in
the Linux
                DVB-API called "S2API" and now DVB API 5 in order to tune an
ISDB-T/ISDB-Tsb
                demodulator:</para>

        <para>This ISDB-T/ISDB-Tsb API extension should reflect all information
                needed to tune any ISDB-T/ISDB-Tsb hardware. Of course it is
possible
                that some very sophisticated devices won't need certain
parameters to
                tune.</para>

        <para>The information given here should help application writers to know
how
                to handle ISDB-T and ISDB-Tsb hardware using the Linux
DVB-API.</para>

        <para>The details given here about ISDB-T and ISDB-Tsb are just enough
to
                basically show the dependencies between the needed parameter
values,
                but surely some information is left out. For more detailed
information
                see the following documents:</para>

        <para>ARIB STD-B31 - "Transmission System for Digital Terrestrial
                Television Broadcasting" and</para>
        <para>ARIB TR-B14 - "Operational Guidelines for Digital Terrestrial
                Television Broadcasting".</para>

        <para>In order to read this document one has to have some knowledge the
                channel structure in ISDB-T and ISDB-Tsb. I.e. it has to be
known to
                the reader that an ISDB-T channel consists of 13 segments, that
it can
                have up to 3 layer sharing those segments, and things like
that.</para>

        <para>Parameters used by ISDB-T and ISDB-Tsb.</para>

        <section id="isdbt-parms">
                <title>Parameters that are common with DVB-T and ATSC</title>

                <section id="isdbt-freq">
                        <title><constant>DTV_FREQUENCY</constant></title>

                        <para>Central frequency of the channel.</para>

                        <para>For ISDB-T the channels are usally transmitted
with an offset of 143kHz. E.g. a
```

valid frequncy could be 474143 kHz. The stepping is bound to the bandwidth of
the channel which is 6MHz.</para>

<para>As in ISDB-Tsb the channel consists of only one or three segments the
frequency step is 429kHz, 3*429 respectively. As for ISDB-T the
central frequency of the channel is expected.</para>
</section>

<section id="isdbt-bw">
<title><constant>DTV_BANDWIDTH_HZ</constant> (optional)</title>

<para>Possible values:</para>

<para>For ISDB-T it should be always 6000000Hz (6MHz)</para>
<para>For ISDB-Tsb it can vary depending on the number of connected segments</para>

<para>Note: Hardware specific values might be given here, but standard
applications should not bother to set a value to this field as
standard demods are ignoring it anyway.</para>

<para>Bandwidth in ISDB-T is fixed (6MHz) or can be easily derived from
other parameters (DTV_ISDBT_SB_SEGMENT_IDX, DTV_ISDBT_SB_SEGMENT_COUNT).</para>
</section>

<section id="isdbt-delivery-sys">
<title><constant>DTV_DELIVERY_SYSTEM</constant></title>

<para>Possible values: <constant>SYS_ISDBT</constant></para>
</section>

<section id="isdbt-tx-mode">
<title><constant>DTV_TRANSMISSION_MODE</constant></title>

<para>ISDB-T supports three carrier/symbol-size: 8K, 4K, 2K. It is called
'mode' in the standard: Mode 1 is 2K, mode 2 is 4K, mode 3 is 8K</para>

<para>Possible values: <constant>TRANSMISSION_MODE_2K</constant>, <constant>TRANSMISSION_MODE_8K</constant>,
<constant>TRANSMISSION_MODE_AUTO</constant>, <constant>TRANSMISSION_MODE_4K</constant></para>

```
                        <para>If <constant>DTV_TRANSMISSION_MODE</constant> is
set the <constant>TRANSMISSION_MODE_AUTO</constant> the
                                hardware will try to find the correct FFT-size
(if capable) and will
                                use TMCC to fill in the missing
parameters.</para>

                        <para><constant>TRANSMISSION_MODE_4K</constant> is added
at the same time as the other new parameters.</para>
                </section>

                <section id="isdbt-guard-interval">
                        <title><constant>DTV_GUARD_INTERVAL</constant></title>

                        <para>Possible values:
<constant>GUARD_INTERVAL_1_32</constant>,
<constant>GUARD_INTERVAL_1_16</constant>,
<constant>GUARD_INTERVAL_1_8</constant>,
                                <constant>GUARD_INTERVAL_1_4</constant>,
<constant>GUARD_INTERVAL_AUTO</constant></para>

                        <para>If <constant>DTV_GUARD_INTERVAL</constant> is set
the <constant>GUARD_INTERVAL_AUTO</constant> the hardware will
                                try to find the correct guard interval (if
capable) and will use TMCC to fill
                                in the missing parameters.</para>
                </section>
        </section>
        <section id="isdbt-new-parms">
                <title>ISDB-T only parameters</title>

                <section id="isdbt-part-rec">

<title><constant>DTV_ISDBT_PARTIAL_RECEPTION</constant></title>

                        <para><constant>If
DTV_ISDBT_SOUND_BROADCASTING</constant> is '0' this bit-field represents whether
                                the channel is in partial reception mode or
not.</para>

                        <para>If '1' <constant>DTV_ISDBT_LAYERA_*</constant>
values are assigned to the center segment and

<constant>DTV_ISDBT_LAYERA_SEGMENT_COUNT</constant> has to be '1'.</para>

                        <para>If in addition
<constant>DTV_ISDBT_SOUND_BROADCASTING</constant> is '1'
                                <constant>DTV_ISDBT_PARTIAL_RECEPTION</constant>
represents whether this ISDB-Tsb channel
                                is consisting of one segment and layer or three
segments and two layers.</para>

                        <para>Possible values: 0, 1, -1 (AUTO)</para>
                </section>
```

```
                <section id="isdbt-sound-bcast">

<title><constant>DTV_ISDBT_SOUND_BROADCASTING</constant></title>

                        <para>This field represents whether the other
DTV_ISDBT_*-parameters are
                                referring to an ISDB-T and an ISDB-Tsb channel.
(See also

<constant>DTV_ISDBT_PARTIAL_RECEPTION</constant>).</para>

                        <para>Possible values: 0, 1, -1 (AUTO)</para>
                </section>

                <section id="isdbt-sb-ch-id">

<title><constant>DTV_ISDBT_SB_SUBCHANNEL_ID</constant></title>

                        <para>This field only applies if
<constant>DTV_ISDBT_SOUND_BROADCASTING</constant> is '1'.</para>

                        <para>(Note of the author: This might not be the correct
description of the
                                <constant>SUBCHANNEL-ID</constant> in all
details, but it is my understanding of the technical
                                background needed to program a device)</para>

                        <para>An ISDB-Tsb channel (1 or 3 segments) can be
broadcasted alone or in a
                                set of connected ISDB-Tsb channels. In this set
of channels every
                                channel can be received independently. The
number of connected
                                ISDB-Tsb segment can vary, e.g. depending on the
frequency spectrum
                                bandwidth available.</para>

                        <para>Example: Assume 8 ISDB-Tsb connected segments are
broadcasted. The
                                broadcaster has several possibilities to put
those channels in the
                                air: Assuming a normal 13-segment ISDB-T
spectrum he can align the 8
                                segments from position 1-8 to 5-13 or anything
in between.</para>

                        <para>The underlying layer of segments are subchannels:
each segment is
                                consisting of several subchannels with a
predefined IDs. A sub-channel
                                is used to help the demodulator to synchronize
on the channel.</para>

                        <para>An ISDB-T channel is always centered over all
sub-channels. As for
                                the example above, in ISDB-Tsb it is no longer
```

as simple as that.</para>

<para><constant>The DTV_ISDBT_SB_SUBCHANNEL_ID</constant> parameter is used to give the
sub-channel ID of the segment to be demodulated.</para>

<para>Possible values: 0 .. 41, -1 (AUTO)</para>
</section>

<section id="isdbt-sb-seg-idx">

<title><constant>DTV_ISDBT_SB_SEGMENT_IDX</constant></title>

<para>This field only applies if <constant>DTV_ISDBT_SOUND_BROADCASTING</constant> is '1'.</para>

<para><constant>DTV_ISDBT_SB_SEGMENT_IDX</constant> gives the index of the segment to be
demodulated for an ISDB-Tsb channel where several of them are
transmitted in the connected manner.</para>

<para>Possible values: 0 .. <constant>DTV_ISDBT_SB_SEGMENT_COUNT</constant> - 1</para>

<para>Note: This value cannot be determined by an automatic channel search.</para>
</section>

<section id="isdbt-sb-seg-cnt">

<title><constant>DTV_ISDBT_SB_SEGMENT_COUNT</constant></title>

<para>This field only applies if <constant>DTV_ISDBT_SOUND_BROADCASTING</constant> is '1'.</para>

<para><constant>DTV_ISDBT_SB_SEGMENT_COUNT</constant> gives the total count of connected ISDB-Tsb
channels.</para>

<para>Possible values: 1 .. 13</para>

<para>Note: This value cannot be determined by an automatic channel search.</para>
</section>

<section id="isdb-hierq-layers">
<title>Hierarchical layers</title>

<para>ISDB-T channels can be coded hierarchically. As opposed to DVB-T in
ISDB-T hierarchical layers can be decoded simultaneously. For that
reason a ISDB-T demodulator has 3 viterbi and 3

reed-solomon-decoders.</para>

<para>ISDB-T has 3 hierarchical layers which each can use a part of the
available segments. The total number of segments over all layers has
to 13 in ISDB-T.</para>

<section id="isdbt-layer-ena">

<title><constant>DTV_ISDBT_LAYER_ENABLED</constant></title>

<para>Hierarchical reception in ISDB-T is achieved by enabling or disabling
layers in the decoding process. Setting all bits of

<constant>DTV_ISDBT_LAYER_ENABLED</constant> to '1' forces all layers (if applicable) to be
demodulated. This is the default.</para>

<para>If the channel is in the partial reception mode

(<constant>DTV_ISDBT_PARTIAL_RECEPTION</constant> = 1) the central segment can be decoded
independently of the other 12 segments. In that mode layer A has to
have a
<constant>SEGMENT_COUNT</constant> of 1.</para>

<para>In ISDB-Tsb only layer A is used, it can be 1 or 3 in ISDB-Tsb
according to
<constant>DTV_ISDBT_PARTIAL_RECEPTION</constant>.
<constant>SEGMENT_COUNT</constant> must be filled
accordingly.</para>

<para>Possible values: 0x1, 0x2, 0x4 (|-able)</para>

<para><constant>DTV_ISDBT_LAYER_ENABLED[0:0]</constant> - layer A</para>

<para><constant>DTV_ISDBT_LAYER_ENABLED[1:1]</constant> - layer B</para>

<para><constant>DTV_ISDBT_LAYER_ENABLED[2:2]</constant> - layer C</para>

<para><constant>DTV_ISDBT_LAYER_ENABLED[31:3]</constant> unused</para>
</section>

<section id="isdbt-layer-fec">

<title><constant>DTV_ISDBT_LAYER*_FEC</constant></title>

<para>Possible values:

```
<constant>FEC_AUTO</constant>, <constant>FEC_1_2</constant>,
<constant>FEC_2_3</constant>, <constant>FEC_3_4</constant>,
<constant>FEC_5_6</constant>, <constant>FEC_7_8</constant></para>
                        </section>

                        <section id="isdbt-layer-mod">

<title><constant>DTV_ISDBT_LAYER*_MODULATION</constant></title>

                                <para>Possible values:
<constant>QAM_AUTO</constant>, QP<constant>SK, QAM_16</constant>,
<constant>QAM_64</constant>, <constant>DQPSK</constant></para>

                                <para>Note: If layer C is
<constant>DQPSK</constant> layer B has to be <constant>DQPSK</constant>. If
layer B is <constant>DQPSK</constant>
                                        and
<constant>DTV_ISDBT_PARTIAL_RECEPTION</constant>=0 layer has to be
<constant>DQPSK</constant>.</para>
                        </section>

                        <section id="isdbt-layer-seg-cnt">

<title><constant>DTV_ISDBT_LAYER*_SEGMENT_COUNT</constant></title>

                                <para>Possible values: 0, 1, 2, 3, 4, 5, 6, 7,
8, 9, 10, 11, 12, 13, -1 (AUTO)</para>

                                <para>Note: Truth table for
<constant>DTV_ISDBT_SOUND_BROADCASTING</constant> and

<constant>DTV_ISDBT_PARTIAL_RECEPTION</constant> and
<constant>LAYER</constant>*_SEGMENT_COUNT</para>

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<entry>SB</entry>
                                                                <entry>Layer A
width</entry>
                                                                <entry>Layer B
width</entry>
                                                                <entry>Layer C
width</entry>
                                                                <entry>total
width</entry>
                                                        </row>

                                                        <row>
                                                                <entry>0</entry>
                                                                <entry>0</entry>
```

```
                                                        <entry>1 ..
13</entry>
                                                        <entry>1 ..
13</entry>
                                                        <entry>1 ..
13</entry>

<entry>13</entry>
                                                </row>

                                                <row>
                                                        <entry>1</entry>
                                                        <entry>0</entry>
                                                        <entry>1</entry>
                                                        <entry>1 ..
13</entry>
                                                        <entry>1 ..
13</entry>

<entry>13</entry>
                                                </row>

                                                <row>
                                                        <entry>0</entry>
                                                        <entry>1</entry>
                                                        <entry>1</entry>
                                                        <entry>0</entry>
                                                        <entry>0</entry>
                                                        <entry>1</entry>
                                                </row>

                                                <row>
                                                        <entry>1</entry>
                                                        <entry>1</entry>
                                                        <entry>1</entry>
                                                        <entry>2</entry>
                                                        <entry>0</entry>

<entry>13</entry>
                                                </row>
                                        </tbody>

                                </tgroup>
                        </informaltable>

                </section>

                <section id="isdbt_layer_t_interl">

<title><constant>DTV_ISDBT_LAYER*_TIME_INTERLEAVING</constant></title>

                        <para>Possible values: 0, 1, 2, 3, -1
(AUTO)</para>

                        <para>Note: The real inter-leaver depth-names
depend on the mode (fft-size); the values
```

```
                here are referring to what can be found
in the TMCC-structure -
                independent of the mode.</para>
            </section>
        </section>
    </section>
</section>
</section>
```