DTV Translator - Implementation
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Introduction

- Translator Types
  - Analog Translator
  - Digital Translator w NTSC re-modulation
  - Digital Translator w 8VSB re-modulation
  - 8VSB On-Channel Booster

- NTIA Grants Availability
- Conclusions
Basic Set-up

- BAND-PASS FILTER
- INPUT (-60dBm ~ -40dBm [6MHz BW])
- LNA
- Translator
- RF AMP
- FCC Mask FILTER
- OUTPUT

- SMPTE-310M or ASI MPEG2 Transport Stream for Digital Translators
- • Local Program Insertion
- • Microwave Input
Basic Equipment

- **Power Meter**
  - Spectrum Analyzer w Power Measurement Capability
  - Wideband Power Meter w front-end 6MHZ BPF
- **8VSB Decoder**
  - Shows you decoded Video & Audio
  - Measures Received SNR, BER, Pwr
- **Translator**
  - Analog Translator or Frequency Translator
  - Digital Translator with Analog (NTSC) Output
  - Digital Transcoder with Digital (8VSB) Output
  - Digital On-Channel Booster
Basic Equipment

- Manufactured by Ktech: DVM-150E
  - 8VSB Receiver/Decoder
  - Meets NTIA 3008 Digital-to-Analog Conversion Eqpt
- Inputs
  - 8VSB RF
  - option for SMPTE-310M and DVB-ASI
- Outputs
  - Measures SNR, BER, Power
  - Analog NTSC Video and Audio w SAP
  - option for ASI and SMPTE-310M Out
Analog Translator - SAW Filter
[Heterodyne Translator]

- Beware: some call this “Digital Processor”
- Poor Adj CH rejection by SAW Filter
- Multi-path at Input is sent out at the Output
- Output SNR Degradation by SAW Filter & Mask Filter
Analog Translator
- Adjacent Channel Interference Issues
## Analog Translator - SAW Filter

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple and reliable</td>
<td>May not provide adequate adjacent channel rejection</td>
</tr>
<tr>
<td>Low cost</td>
<td>No co-channel interference rejection</td>
</tr>
<tr>
<td>Low delay throughput</td>
<td>No multi-path interference rejection</td>
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<tr>
<td></td>
<td>No noise reduction</td>
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<tr>
<td></td>
<td>Output SNR Degradation by SAW filter</td>
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</tbody>
</table>

- Reduction of Coverage and poor signal translation
Digital Translator - NTSC re-modulation

- Digital to Analog Converter
- **Meets NTIA 3008 Digital-to-Analog Conversion Eqpt**
- Agile 8VSB Receiver/Decoder
- Agile NTSC Modulator
- 8VSB in => NTSC Out
- NTIA Grants available for this operation
Digital Translator - NTSC re-modulation

• WHY NOT USE CONSUMER STB?

• Consumer Grade 8VSB Set-Top-Box
  • Low Cost
  • No simultaneous SAP
  • Loss of Power resets to Primary Program
  • No Tech Support [firmware upgrade]

DIGITAL RF INPUT — Video — NTSC Mod — Audio — Output Filter — ANALOG OUTPUT
**Digital Translator - Transcoder**

- Transcoder [8VSB in => 8VSB out]
- **Meets NTIA 3009 Digital-to-Digital Conversion Eqpt**
- Recommended for less than 30W application
- PSIP & TSID Modification
- No output SNR correction
- No output IMD monitoring
<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>8VSB Regeneration</td>
<td>No Feedback for 8VSB output</td>
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<tr>
<td></td>
<td>No Linear Pre-Correction</td>
</tr>
<tr>
<td></td>
<td>No Non-linear Pre-Correction</td>
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<tr>
<td>Low cost</td>
<td>No Detection for IMD Level</td>
</tr>
<tr>
<td></td>
<td>No Detection for TX SNR</td>
</tr>
<tr>
<td>PSIP &amp; TSID Modification</td>
<td>No External 10MHZ Reference</td>
</tr>
</tbody>
</table>
Digital Translator - Transcoder w feedback

- Meets NTIA 3009 Digital-to-Digital Conversion Eqpt
- Feedback adds Capabilities:
  - TX power Monitoring
  - TX SNR Monitoring
  - TX Linear & Non-linear Pre-correction
  - TX IMD Level Monitoring
  - Recommended for >30 W TX Pwr Application
Digital Transcoder with feedback

- Digital 8-VSB Demod/Mod Transcoder
- FCC Mask Filter

Feedback:
- Auto Pre-Correction
- Real-Time Monitoring
  - TX power
  - TX SNR
  - TX IMD Level
- On-Channel Booster Option

Inputs:
- PSIP Modification if needed (Station ID, Major CH, Minor CH)
- ASI/SMPTE-310M Input
- GPS 10MHz Input
- TSID Modification
Digital Translator with 8VSB re-modulation

- Manufactured by Ktech: XTREME-1000
- Meets NTIA 3009 Digital-to-Digital Conversion Eqpt

- Inputs - 8VSB RF
  - SMPTE-310M or DVB-ASI
  - RF Feedback, GPS 10MHZ Ref input

- Outputs - 8VSB RF
  - Measures TX SNR, TX Power
  - PSIP & TSID Modification
  - Auto Lin & Non-Line Pre-Correction allows use of existing RF Amplifier
# Digital Translator with 8VSB re-modulation

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<tr>
<td>Dedicated 8VSB in =&gt; 8VSB out</td>
<td>Higher Cost</td>
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<tr>
<td>Regenerative 8VSB allows:</td>
<td></td>
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<tr>
<td>* Adjacent Ch-Rejection</td>
<td></td>
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<td>* Co-channel Rejection</td>
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<td>Feedback allows:</td>
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<td>* Real-Time Monitoring of Output SNR</td>
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<td>* Real-Time Monitoring of Output PWR</td>
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<td>* Real-Time Monitoring of Output IMD</td>
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<td>Options for GPS Locking &amp; On-Channel Booster</td>
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PSIP Modification by Translators

- Without PSIP Modification
- With PSIP Modification

- Voluntary Requirement by FCC
- Channel Re-Branding
- PSIP Display can be used to identify Translator Operators
- Translator Operator Identification when problems arise
- Built-in to 8VSB Transcoder [no added cost]
Need for Auto Linear & Non-Lin Pre-Correction

Auto Linear Pre-Correction

- Controls Output TX SNR

Auto Non-Linear Pre-Correction

- Adapts to Current RF Amplifiers in use
- Automatic Nonlinear Pre-Correction controls IMD level
TV Translator

- Spectrum Inefficient
Digital On-Channel Booster

- Spectrum Efficient
Digital On-Channel Booster - Gap Fillers

- Use Microwave Eqpt to connect all the Gap Fillers with the Primary Transmitter
- Synchronize the Gap Fillers to the Primary
Digital 8-VSB On-Channel Booster

- Reduced Delay 8-VSB Demod
- Reduced Delay 8-VSB Mod
- DTV MASK FILTER
- GPS Rx
NTIA Grants Available

- [www.ntia.doc.gov](http://www.ntia.doc.gov)
- 8VSB in => NTSC out: Digital to Analog Conversion [section 3008]
- 8VSB in => 8VSB out: Digital to Digital Conversion [section 3009]
## Summary

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<th>Highlights</th>
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<tr>
<td>Analog Translator</td>
<td>Low Cost</td>
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<td>No Regeneration 8VSB</td>
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<td>Poor Adj-Ch rejection</td>
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<td>NTIA 3008 Grants</td>
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Thank you

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