

## Annex 5: Intermodulation measurements

### 1 “B1 Interference” (3<sup>rd</sup> order intermodulation) to VOR reception

Wanted: **VOR**  
 Frequency: 108,2 MHz  
 Level: **-79 dBm** at Rx

Unwanted F1: (variable)  
 Level: 2 dBm

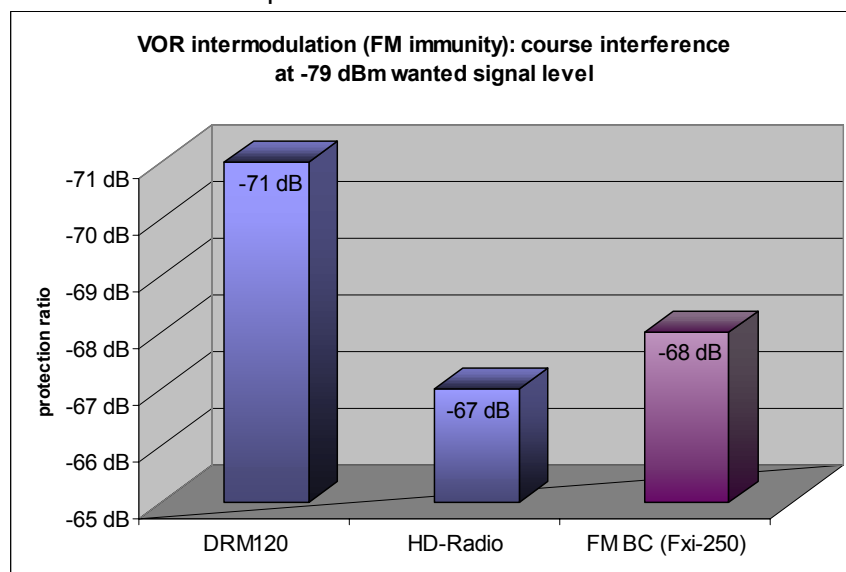
Unwanted F2: NON  
 Level: 2 dBm

Unwanted F3: NON  
 Level: 2 dBm

Total level unwanted: 7 dBm at 0 dB atten.

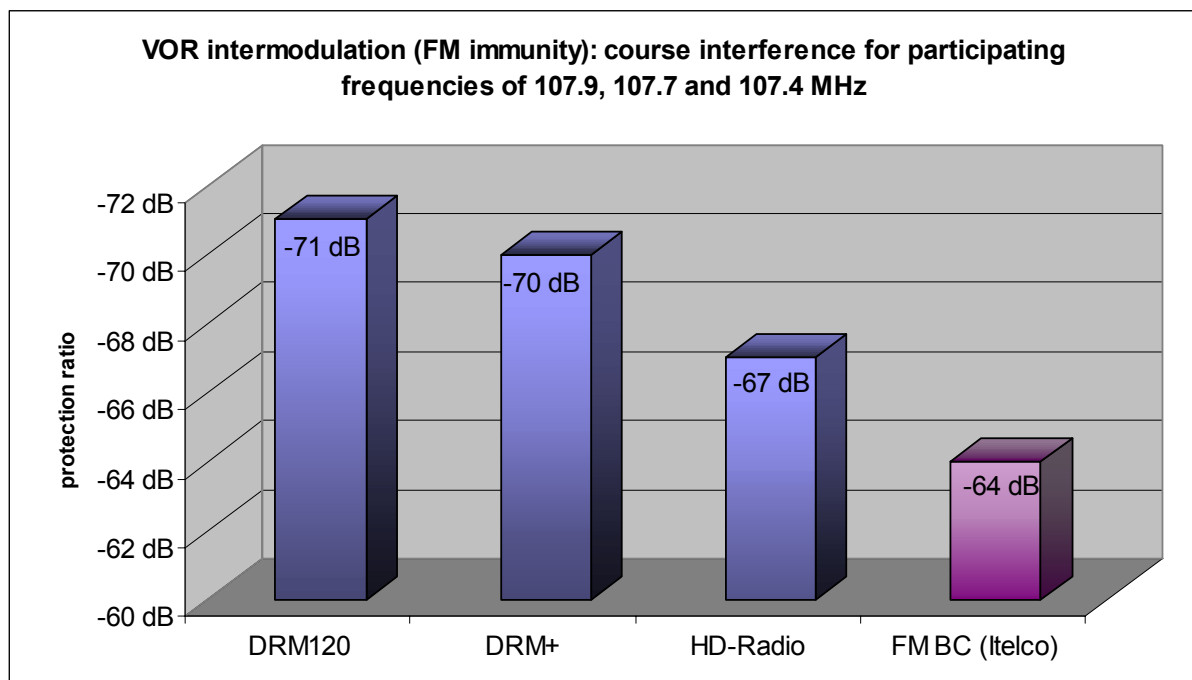
| Unwanted               | F1        | F2        | F3        | Course Interference |             | Flag Interference |             |
|------------------------|-----------|-----------|-----------|---------------------|-------------|-------------------|-------------|
|                        |           |           |           | Level               | Prot. Ratio | Level             | Prot. Ratio |
| DRM120                 | 107,9 MHz | 107,7 MHz | 107,4 MHz | -8 dBm              | -71 dB      | -4 dBm            | -75 dB      |
| DRM120                 | 106,5 MHz | 105,3 MHz | 103,6 MHz | 4 dBm               | -83 dB      | > 7 dBm           | < -86 dB    |
| DRM+                   | 107,9 MHz | 107,7 MHz | 107,4 MHz | -9 dBm              | -70 dB      | -4 dBm            | -75 dB      |
| DRM+                   | 106,5 MHz | 105,3 MHz | 103,6 MHz | not m.              | not m.      | not m.            | not m.      |
| HD-Radio               | 107,9 MHz | 107,7 MHz | 107,4 MHz | -12 dBm             | -67 dB      | -5 dBm            | -74 dB      |
| HD-Radio               | 106,5 MHz | 105,3 MHz | 103,6 MHz | -2 dBm              | -77 dB      | > 7 dBm           | < -86 dB    |
| FM Broadcast (Fxi-250) | 107,9 MHz | 107,7 MHz | 107,4 MHz | -11 dBm             | -68 dB      | -5 dBm            | -74 dB      |
| FM Broadcast (Fxi-250) | 106,5 MHz | 105,3 MHz | 103,6 MHz | -2 dBm              | -77 dB      | > 7 dBm           | < -86 dB    |

Remarks: The FM broadcast signal on the Fxi-250 transmitter was modulated according to ITU-R BS.641 and operated in Mono mode.



| Unwanted        | F1<br>Frequency | F1<br>Offset | Course Interference |               | Flag Interference |               |
|-----------------|-----------------|--------------|---------------------|---------------|-------------------|---------------|
|                 |                 |              | Level               | Prot. Ratio   | Level             | Prot. Ratio   |
| DRM120          | 107,900 MHz     | 0 kHz        | -8 dBm              | -71 dB        | -4 dBm            | -75 dB        |
| DRM120          | 107,870 MHz     | 30 kHz       | not measured        |               | not measured      |               |
| DRM120          | 107,850 MHz     | 50 kHz       | not measured        |               | not measured      |               |
| HD-Radio        | 107,900 MHz     | 0 kHz        | -12 dBm             | -67 dB        | -5 dBm            | -74 dB        |
| HD-Radio        | 107,870 MHz     | 30 kHz       | not measured        |               | not measured      |               |
| HD-Radio        | 107,850 MHz     | 50 kHz       | not measured        |               | not measured      |               |
| FM BC (Itelco)  | 107,900 MHz     | 0 kHz        | -15 dBm             | -64 dB        | -6 dBm            | -73 dB        |
| FM BC (Itelco)  | 107,875 MHz     | 25 kHz       | -9 dBm              | -70 dB        | -2 dBm            | -77 dB        |
| FM BC (Itelco)  | 107,850 MHz     | 50 kHz       | -6 dBm              | -73 dB        | 2 dBm             | -81 dB        |
| FM BC (Itelco)  | 107,825 MHz     | 75 kHz       | -6 dBm              | -73 dB        | 1 dBm             | -80 dB        |
| FM BC (Fxi-250) | 107,900 MHz     | 0 kHz        | -11 dBm             | -68 dB        | -5 dBm            | -74 dB        |
| FMEExtra        | 107,900 MHz     | 0 kHz        | -15 dBm             | -64 dB        | -5 dBm            | -74 dB        |
| FMEExtra        | 107,875 MHz     | 25 kHz       | -9 dBm              | -70 dB        | -2 dBm            | -77 dB        |
| FMEExtra        | 107,850 MHz     | 50 kHz       | -6 dBm              | -73 dB        | 2 dBm             | -81 dB        |
| FMEExtra        | 107,825 MHz     | 75 kHz       | -7 dBm              | -72 dB        | 1 dBm             | -80 dB        |
| DRM+            | 107,900 MHz     | 0 kHz        | -9 dBm              | -70 dB        | -4 dBm            | -75 dB        |
| DRM+            | 107,870 MHz     | 30 kHz       | -9 dBm              | -70 dB        | -4 dBm            | -75 dB        |
| DRM+            | 107,850 MHz     | 50 kHz       | -7 dBm              | -72 dB        | -3 dBm            | -76 dB        |
| DRM+            | 107,825 MHz     | 75 kHz       | -1 dBm              | -78 dB        | 5 dBm             | -84 dB        |
| DRM+            | 107,800 MHz     | 100 kHz      | <b>-6 dBm</b>       | <b>-73 dB</b> | <b>2 dBm</b>      | <b>-81 dB</b> |

Remarks: The FM broadcast signal on the Fxi-250 transmitter was modulated according to ITU-R BS.641 and operated in Mono mode, the signal on the Itelco transmitter was modulated according to ITU-R IS.1140 and operated in stereo mode.



Wanted: **VOR**  
 Frequency: 108,2 MHz  
 Level: **-63 dBm** at Rx

Unwanted F1: (variable)  
 Level: 2 dBm

Unwanted F2: NON  
 Level: 2 dBm

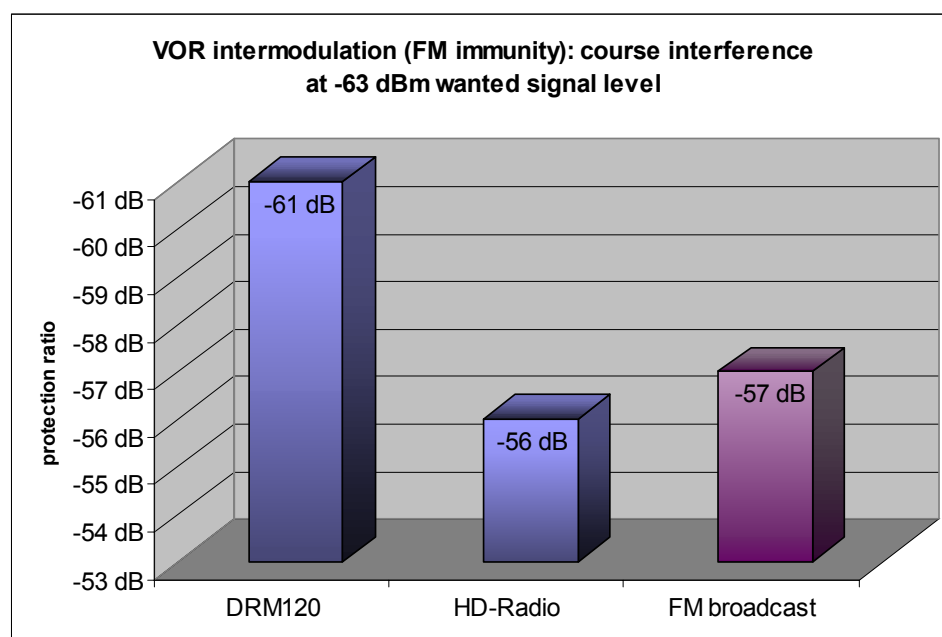
Unwanted F3: NON  
 Level: 2 dBm

Total level unwanted: 7 dBm at 0 dB atten.

| Unwanted               | F1        | F2        | F3        | Course interference |             | Flag interference |             |
|------------------------|-----------|-----------|-----------|---------------------|-------------|-------------------|-------------|
|                        |           |           |           | Level               | Prot. Ratio | Level             | Prot. Ratio |
| DRM120                 | 107,9 MHz | 107,7 MHz | 107,4 MHz | -2 dBm              | -61 dB      | 1 dBm             | -64 dB      |
| DRM120                 | 106,5 MHz | 105,3 MHz | 103,6 MHz | > 7 dBm             | < -70 dB    | > 7 dBm           | < -70 dB    |
| HD-Radio               | 107,9 MHz | 107,7 MHz | 107,4 MHz | -7 dBm              | -56 dB      | 0 dBm             | -63 dB      |
| HD-Radio               | 106,5 MHz | 105,3 MHz | 103,6 MHz | > 7 dBm             | < -70 dB    | > 7 dBm           | < -70 dB    |
| FM Broadcast (Fxi-250) | 107,9 MHz | 107,7 MHz | 107,4 MHz | -6 dBm              | -57 dB      | 0 dBm             | -63 dB      |
| FM Broadcast (Fxi-250) | 106,5 MHz | 105,3 MHz | 103,6 MHz | > 7 dBm             | < -70 dB    | > 7 dBm           | < -70 dB    |
| DRM+                   | 107,9 MHz | 107,7 MHz | 107,4 MHz | Not measured        |             | Not measured      |             |
| DRM+                   | 106,5 MHz | 105,3 MHz | 103,6 MHz | Not measured        |             | Not measured      |             |

Additional test:

Shifting the DRM120 frequency by 0 - 20 kHz showed no difference in protection ratio. This proves that there is no dependency on the exact frequencies of the DRM subcarriers.



## 2 “B1 Interference” (3<sup>rd</sup> order intermodulation) to ILS reception

Wanted: **ILS**  
 Frequency: 108,1 MHz  
 Level: **-86 dBm** at Rx

Unwanted F1: (variable)  
 Level: 2 dBm

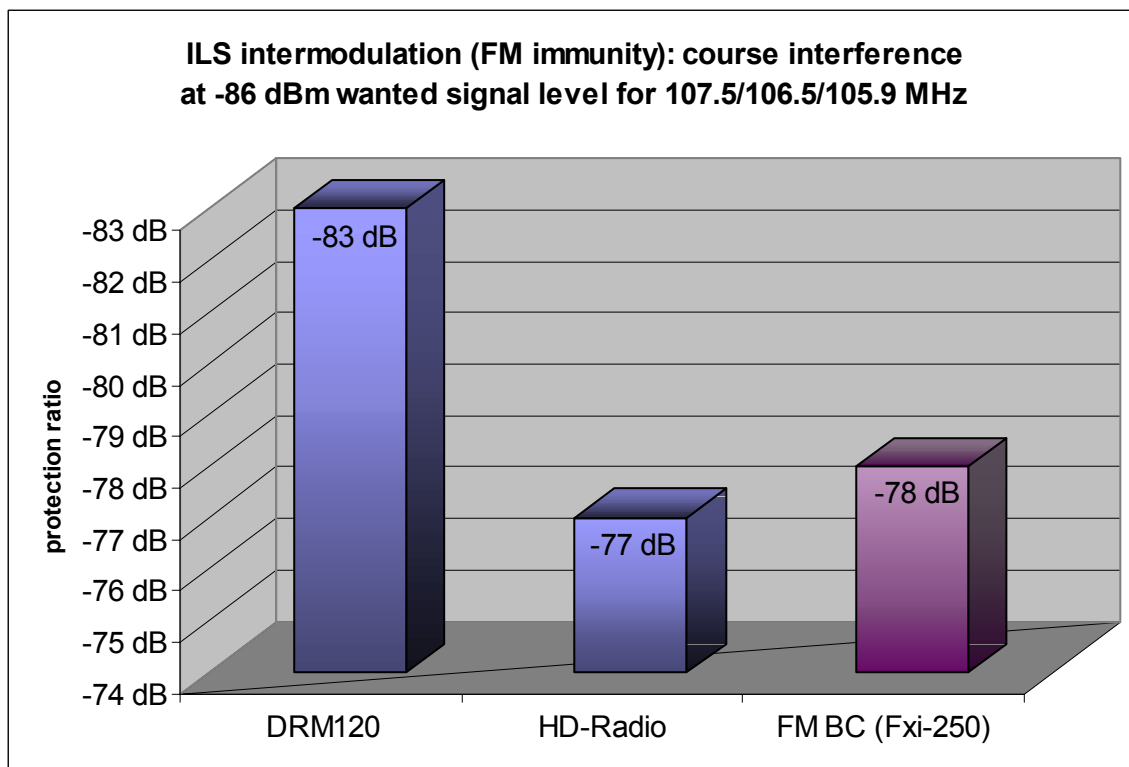
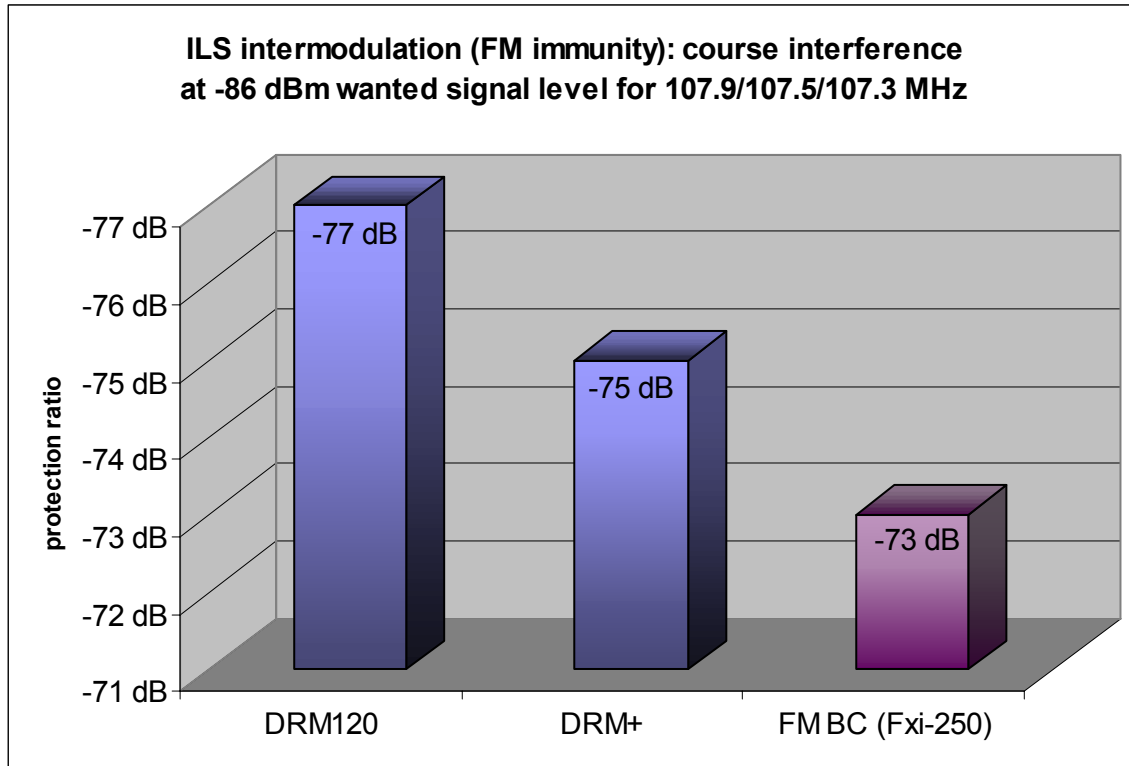
Unwanted F2: N0N  
 Level: 2 dBm

Unwanted F3: N0N  
 Level: 2 dBm

Total level unwanted: 7 dBm at 0 dB atten.

| Unwanted                | F1        | F2        | F3        | Course Interference |             | Flag Interference |             |
|-------------------------|-----------|-----------|-----------|---------------------|-------------|-------------------|-------------|
|                         |           |           |           | Level               | Prot. Ratio | Level             | Prot. Ratio |
| DRM120                  | 107,9 MHz | 107,5 MHz | 107,3 MHz | -9 dBm              | -77 dB      | -4 dBm            | -82 dB      |
| DRM120                  | 107,5 MHz | 106,5 MHz | 105,9 MHz | -3 dBm              | -83 dB      | 1 dBm             | -87 dB      |
| DRM120                  | 106,5 MHz | 104,5 MHz | 102,9 MHz | 3 dBm               | -89 dB      | 7 dBm             | -93 dB      |
| HD-Radio                | 107,9 MHz | 107,5 MHz | 107,3 MHz | not meas.           | not meas.   | not meas.         | not meas.   |
| HD-Radio                | 107,5 MHz | 106,5 MHz | 105,9 MHz | -9 dBm              | -77 dB      | 0 dBm             | -86 dB      |
| HD-Radio                | 106,5 MHz | 104,5 MHz | 102,9 MHz | -3 dBm              | -83 dB      | 5 dBm             | -91 dB      |
| FM broadc.<br>(Fxi-250) | 107,9 MHz | 107,5 MHz | 107,3 MHz | -13 dBm             | -73 dB      | -4 dBm            | -82 dB      |
| FM broadc.<br>(Fxi-250) | 107,5 MHz | 106,5 MHz | 105,9 MHz | -8 dBm              | -78 dB      | 0 dBm             | -86 dB      |
| FM broadc.<br>(Fxi-250) | 106,5 MHz | 104,5 MHz | 102,9 MHz | -3 dBm              | -83 dB      | 5 dBm             | -91 dB      |
| DRM+                    | 107,9 MHz | 107,5 MHz | 107,3 MHz | -11 dBm             | -75 dB      | -5 dBm            | -81 dB      |
| DRM+                    | 107,5 MHz | 106,5 MHz | 105,9 MHz | Not measured        |             | Not measured      |             |
| DRM+                    | 106,5 MHz | 104,5 MHz | 102,9 MHz | Not measured        |             | Not measured      |             |

Remarks: The FM broadcast signal on the Fxi-250 transmitter was modulated according to ITU-R BS.641 and operated in Mono mode.



Wanted: **ILS**  
 Frequency: 108,1 MHz  
 Level: **-70 dBm** at Rx

Unwanted F1: (variable)  
 Level: 2 dBm

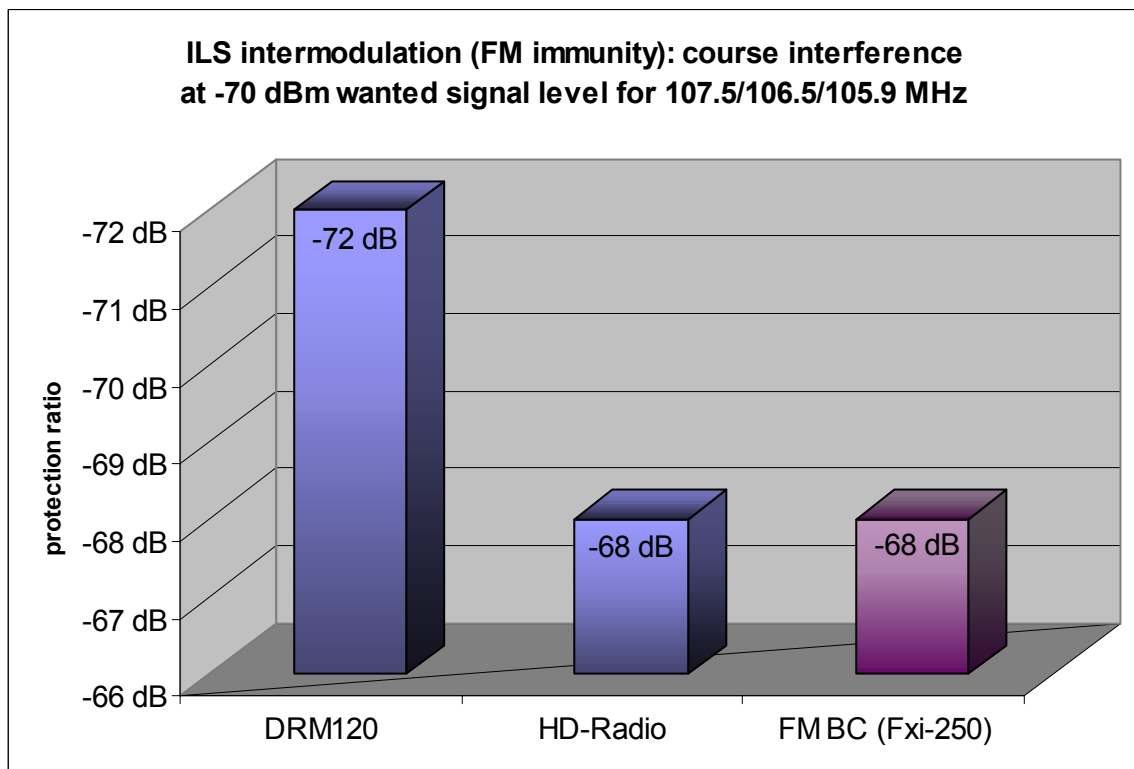
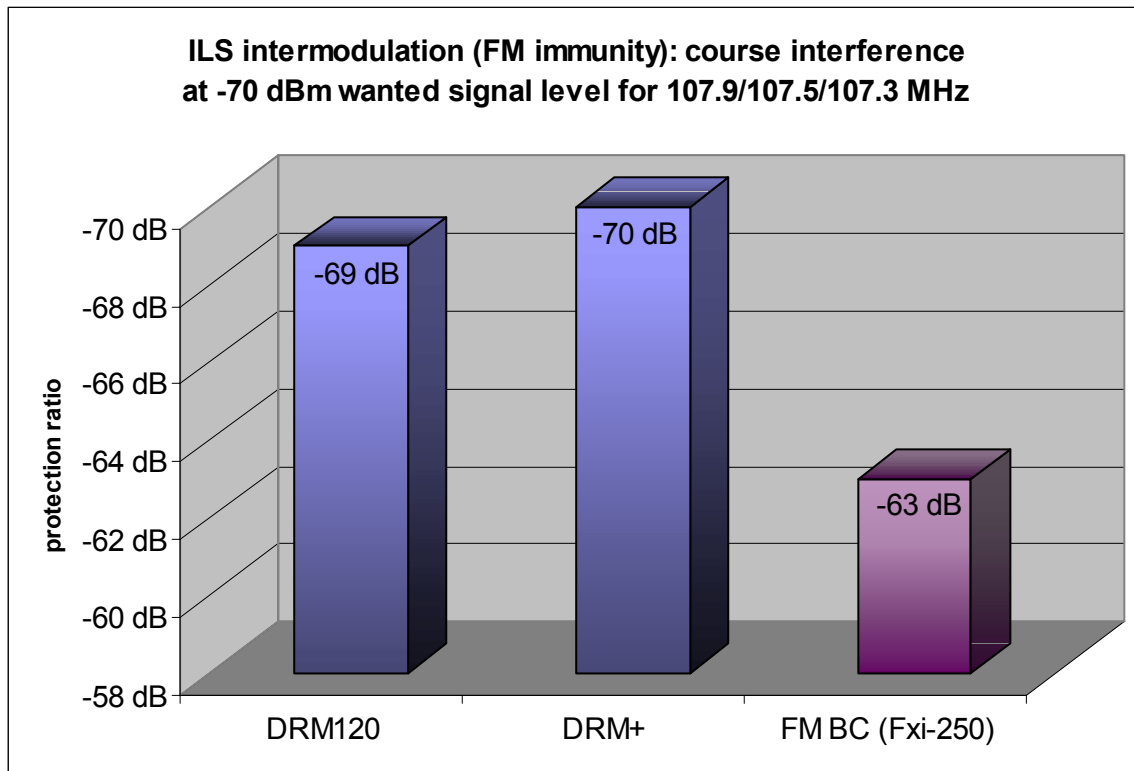
Unwanted F2: NON  
 Level: 2 dBm

Unwanted F3: NON  
 Level: 2 dBm

Total level unwanted: 7 dBm at 0 dB atten.

| Unwanted                | F1        | F2        | F3        | Course interference |             | Flag interference |             |
|-------------------------|-----------|-----------|-----------|---------------------|-------------|-------------------|-------------|
|                         |           |           |           | Level               | Prot. Ratio | Level             | Prot. Ratio |
| DRM120                  | 107,9 MHz | 107,5 MHz | 107,3 MHz | -1 dBm              | -69 dB      | 2 dBm             | -72 dB      |
| DRM120                  | 107,5 MHz | 106,5 MHz | 105,9 MHz | 2 dBm               | -72 dB      | 6 dBm             | -76 dB      |
| DRM120                  | 106,5 MHz | 104,5 MHz | 102,9 MHz | > 7 dBm             | < -77 dB    | > 7 dBm           | < -77 dB    |
| HD-Radio                | 107,9 MHz | 107,5 MHz | 107,3 MHz | not meas.           | not meas.   | not meas.         | not meas.   |
| HD-Radio                | 107,5 MHz | 106,5 MHz | 105,9 MHz | -2 dBm              | -68 dB      | 5 dBm             | -75 dB      |
| HD-Radio                | 106,5 MHz | 104,5 MHz | 102,9 MHz | 4 dBm               | -74 dB      | > 7 dBm           | < -77 dB    |
| FM broadc.<br>(Fxi-250) | 107,9 MHz | 107,5 MHz | 107,3 MHz | -7 dBm              | -63 dB      | 1 dBm             | -71 dB      |
| FM broadc.<br>(Su155)   | 107,5 MHz | 106,5 MHz | 105,9 MHz | -2 dBm              | -68 dB      | 5 dBm             | -75 dB      |
| FM broadc.<br>(Fxi-250) | 106,5 MHz | 104,5 MHz | 102,9 MHz | 4 dBm               | -74 dB      | > 7 dBm           | < -77 dB    |
| DRM+                    | 107,9 MHz | 107,5 MHz | 107,3 MHz |                     | -70 dB      |                   | -70 dB      |
| DRM+                    | 107,5 MHz | 106,5 MHz | 105,9 MHz |                     | -70 dB      |                   | -70 dB      |
| DRM+                    | 106,5 MHz | 104,5 MHz | 102,9 MHz |                     | -70 dB      |                   | -70 dB      |

Remarks: The FM broadcast signal on the Fxi-250 transmitter was modulated according to ITU-R BS.641 and operated in Mono mode.



| Unwanted       | F1<br>Frequency | F1<br>Offset | Course Interference |               | Flag Interference |               |
|----------------|-----------------|--------------|---------------------|---------------|-------------------|---------------|
|                |                 |              | Level               | Prot. Ratio   | Level             | Prot. Ratio   |
| DRM120         | 107,900 MHz     | 0 kHz        | -9 dBm              | -77 dB        | -4 dBm            | -82 dB        |
| DRM120         | 107,870 MHz     | 30 kHz       | not measured        |               | not measured      |               |
| DRM120         | 107,850 MHz     | 50 kHz       | not measured        |               | not measured      |               |
| HD-Radio       | 107,900 MHz     | 0 kHz        | not measured        |               | not measured      |               |
| HD-Radio       | 107,870 MHz     | 30 kHz       | not measured        |               | not measured      |               |
| HD-Radio       | 107,850 MHz     | 50 kHz       | not measured        |               | not measured      |               |
| FM BC (Itelco) | 107,900 MHz     | 0 kHz        | -15 dBm             | -71 dB        | -7 dBm            | -79 dB        |
| FM BC (Itelco) | 107,875 MHz     | 25 kHz       | -9 dBm              | -77 dB        | -3 dBm            | -83 dB        |
| FM BC (Itelco) | 107,850 MHz     | 50 kHz       | -7 dBm              | -79 dB        | -1 dBm            | -85 dB        |
| FM BC (Itelco) | 107,825 MHz     | 75 kHz       | -10 dBm             | -76 dB        | -3 dBm            | -83 dB        |
| DRM+           | 107,900 MHz     | 0 kHz        | -11 dBm             | -75 dB        | -5 dBm            | -81 dB        |
| DRM+           | 107,870 MHz     | 30 kHz       | -10 dBm             | -76 dB        | -4 dBm            | -82 dB        |
| DRM+           | 107,850 MHz     | 50 kHz       | -7 dBm              | -79 dB        | -3 dBm            | -83 dB        |
| DRM+           | 107,825 MHz     | 75 kHz       | -6 dBm              | -80 dB        | 2 dBm             | -88 dB        |
| DRM+           | 107,800 MHz     | 100 kHz      | <i>-7 dBm</i>       | <i>-79 dB</i> | <i>-1 dBm</i>     | <i>-85 dB</i> |

Remarks: The FM broadcast signal on the Itelco transmitter was modulated according to ITU-R IS.1140 and operated in stereo mode.

