TECHNICAL
DOCUMENTATION

# DTV Utah, Salt Lake City

BROADCAST

**759 25063** | Version 3
fully capable for CP
azimuth headings 37°, 155°, 270°

KATHREIN

# Description

1. Antenna system

The antenna system consists of two sub-systems: System 1 (top system), system 2 (bottom system). Both decompose into 8 bays, which 3 panels per bay. Each panel, in turn, exhibits two connectors (Din 13-30) to feed a crossed dipole system. By feeding both parts in phase, with 180° or 90°, the polarization can be altered from vertical, to horizontal or circular. Any phases in between create elliptical polarization (general polarization ellipse).

The characteristic impedance of internal cabling is 50Ω. However, the main feeder inputs are designed to match a 75Ω feed system. For operation with the existing 50 Ω feed system, a transition from 75 Ω to 50 Ω can be provided.

Both systems stand a maximum power of 90 kW at main feeder input.

2. Altered headings

The azimuth headings were altered to 37°, 155°, 270°.

Only horizontal components were considered.

# General Specifications

| | |
|---|---|
| possible signal modulations | ATSC 1.0, ATSC 3.0 |
| polarization | default: horizontal, capable for fully circular |
| impedance in harness<br>impedance at main splitter input | 50Ω unbalanced<br>75Ω unbalanced |
| gain * reference to λ/2 dipole<br>(at main splitter input) | ~15 dBd (for the horizontal component) |
| VSWR within (frequency range) (channels)<br>(at main splitter input) | VSWR ≤ 1.2 (over complete band)<br>VSWR ≤ 1.15 (in channels) |
| horizontal radiation pattern | see figure sheet 101 |
| vertical radiation pattern | see figure sheet 102 |
| absolute maximum power at feeder input<br>(at main splitter input) | 90 kW |
| voltage resistance for ATSC 1.0<br>@ 13 dB Crest factor (envelope model)* | Yes, up to max. power 90 kW. |
| voltage resistance for ATSC 3.0<br>@ 16dB Crest factor (envelope model)* | Yes, up to max. power 90 kW. |

*Remark:
The Crest factors match the actual and assigned signals for DTV Utah.

# General Specifications

| | |
|---|---|
| construcitonal features | see figure sheet 109 |
| frequency range | 470 - 608 MHz |
| operating channels (US) | CH 17 / 19 / 23 / 27 |
| possible signal modulations | ATSC 1.0, ATSC 3.0 |
| polarization | default: horizontal, capable for fully circular |
| impedance in harness<br>impedance at main splitter input | 50Ω unbalanced<br>75Ω unbalanced |
| gain * reference to λ/2 dipole<br>(at main splitter input) | ~14 dBd (for the horizontal component) |
| VSWR within (frequency range) (channels)<br>(at main splitter input) | VSWR ≤ 1.2 (over complete band)<br>VSWR ≤ 1.15 (in channels) |
| horizontal radiation pattern | see figure sheet 101 |
| vertical radiation pattern | see figure sheet 102 |
| absolute maximum power at feeder input<br>(at main splitter input) | 90 kW |
| voltage resistance for ATSC 1.0<br>@ 13 dB Crest factor (envelope model)* | Yes, up to max. power 90 kW. |
| voltage resistance for ATSC 3.0<br>@ 16dB Crest factor (envelope model)* | Yes, up to max. power 90 kW. |

*Remark:
The Crest factors match the actual and assigned signals for DTV Utah.

# ERP Gain Calculation

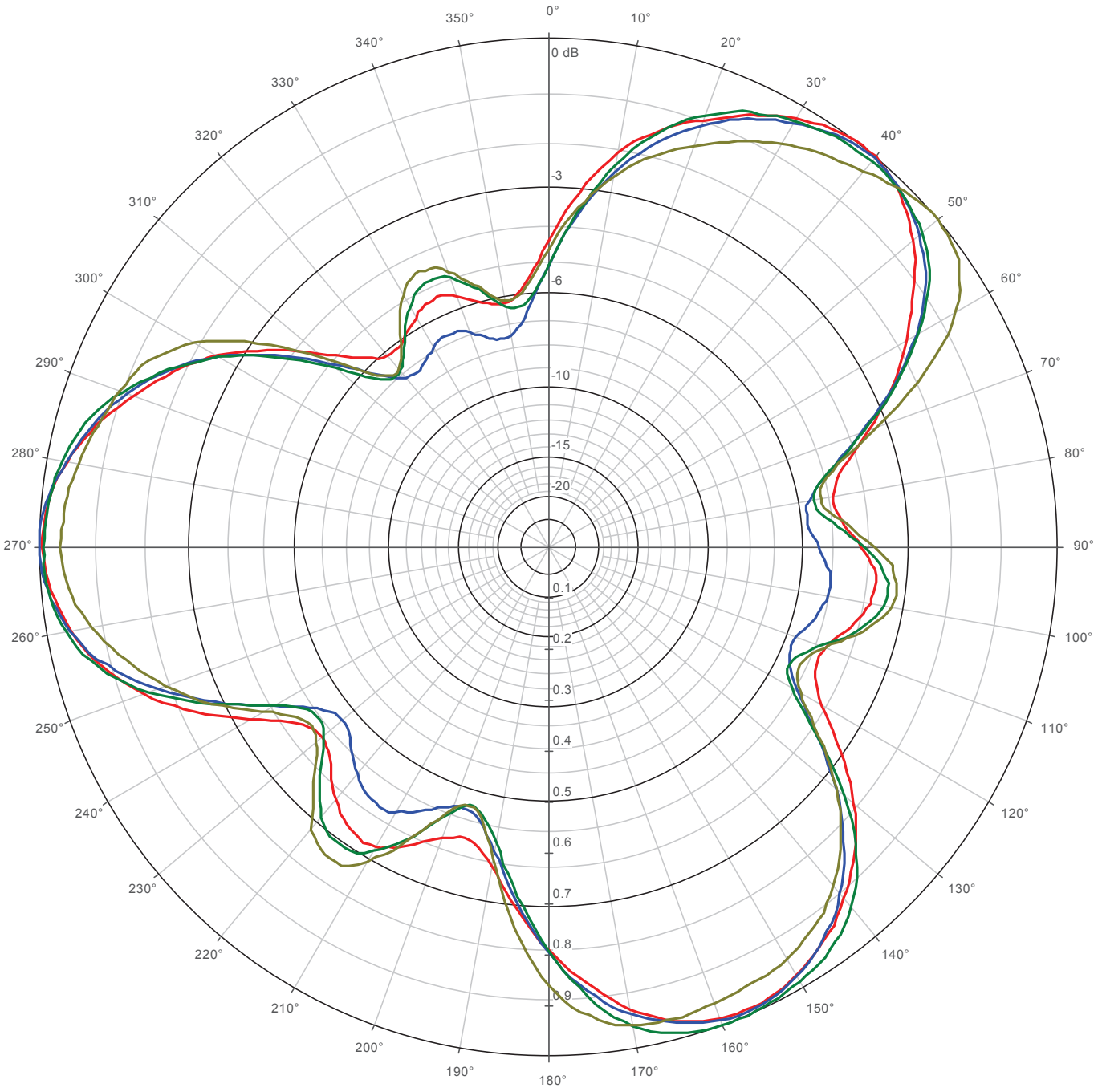
| operating channels (US) | 17 | 19 | 23 | 27 | | 30 | 34 | 35 | 36 | |
|---|---|---|---|---|---|---|---|---|---|---|
| **midband frequency** | **491** | **503** | **527** | **551** | | **569** | **593** | **599** | **605** | **MHz** |
| | | | | | | | | | | |
| horizontal directivity | 2.3 | 2.6 | 2.4 | 2.4 | | 2.6 | 2.9 | 2.9 | 3.1 | dBd |
| vertical directivity | 12.0 | 12.2 | 12.4 | 12.7 | | 12.8 | 13.0 | 13.0 | 13.0 | dBd |
| | | | | | | | | | | |
| loss due to beamtilt | 0.03 | 0.04 | 0.04 | 0.05 | | 0.07 | 0.11 | 0.12 | 0.12 | dB |
| | | | | | | | | | | |
| loss due to nullfill | 0.26 | 0.26 | 0.26 | 0.26 | | 0.27 | 0.28 | 0.27 | 0.17 | dB |
| | | | | | | | | | | |
| | | | | | | | | | | |
| attenuation harness cabling | 0.48 | 0.49 | 0.50 | 0.51 | | 0.67 | 0.69 | 0.69 | 0.69 | dB |
| | | | | | | | | | | |
| **system gain 1** | **13.6** | **14.0** | **14.0** | **14.3** | | **14.4** | **14.8** | **14.8** | **15.2** | **dBd** |
| (at main splitter input) | | | | | | | | | | |
| | | | | | | | | | | |
| attenuation main feeder cable | 0.4 | 0.4 | 0.4 | 0.4 | | 0.5 | 0.5 | 0.5 | 0.5 | dB |
| (estimation 100m 6", 50Ω ) | | | | | | | | | | |
| | | | | | | | | | | |
| **system gain 2** | **13.2** | **13.6** | **13.6** | **13.8** | | **14.0** | **14.3** | **14.4** | **14.7** | **dBd** |
| (at feeder input) | 20.7 | 22.8 | 22.8 | 24.1 | | 24.9 | 27.2 | 27.3 | 29.4 | lin. |
| | | | | | | | | | | |
| Assigned repack ERP | 188 | 114 | 398 | 133 | | 389 | 423 | 157 | 200 | **kW** |
| | | | | | | | | | | |
| **required transmit power** | **9.1** | **5.0** | **17.5** | **5.5** | | **15.6** | **15.6** | **5.8** | **6.8** | **kW** |
| (at input feeder cable) | | | | | | | | | | |
| | | | | | | | | | | |
| total power per sub-system | 37.1 | | | | | 43.7 | | | | kW |

Remarks:

The top system exhibits greater cable lengths than the bottom system due to the fact that both main splitters are mounted in the bottom of cylinder. We assumed approx. 100m feeder length due to tower height of 80m.

The vertical component was neglected.

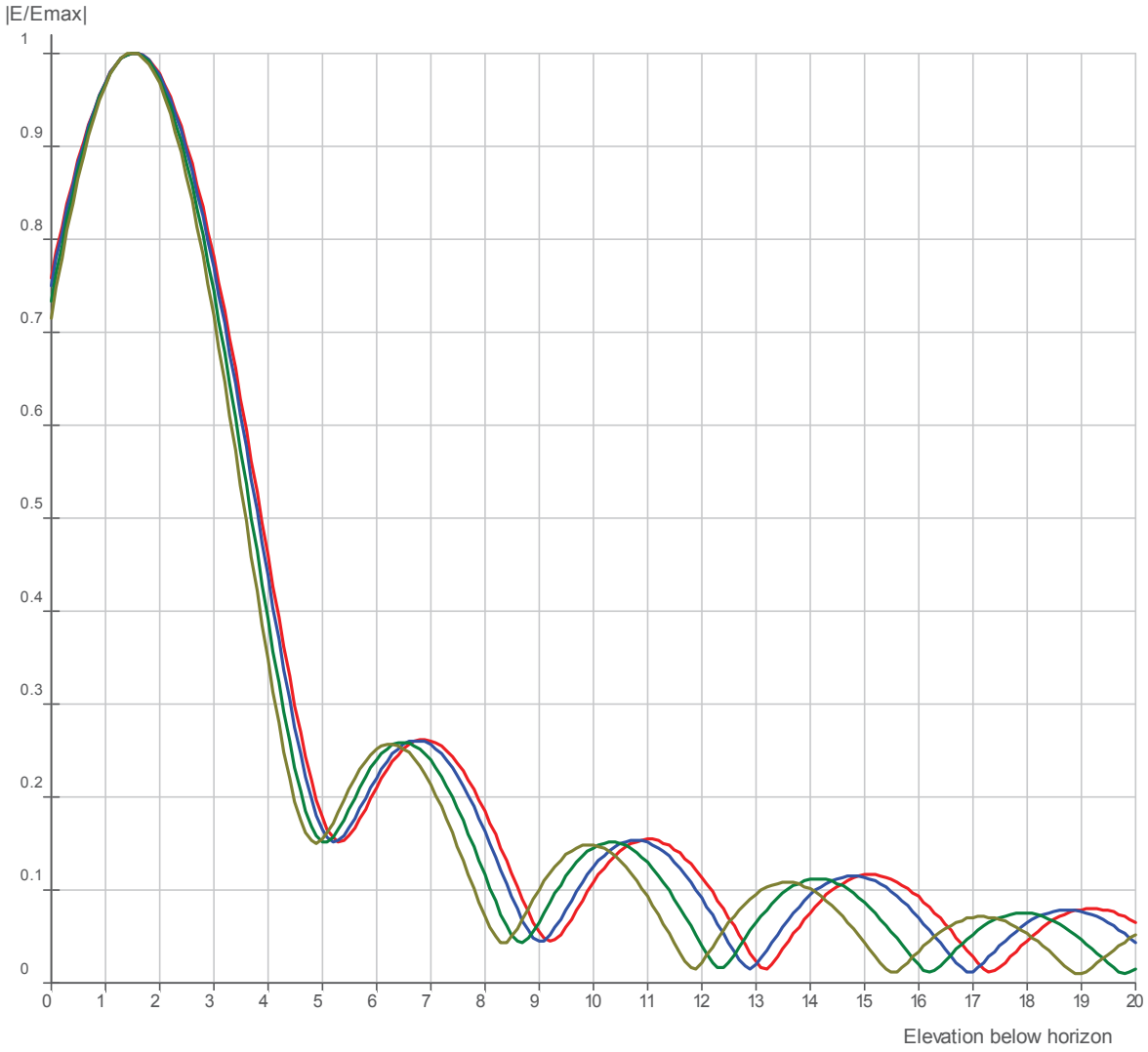
| KATHREIN | Date: 19.08.2017 | DTV Utah, Salt Lake City | Type No.: 759 25063 |
|---|---|---|---|
| | Sign / Name BSR / Ki | System 1 (top) and 2 (bottom) | Blatt Nr.: 105 |




| Frequency (MHz): | 491 | 503 | 527 | 551 |
|---|---|---|---|---|
| Elevation below horizon: | 1.5° | 1.5° | 1.5° | 1.5° |

Bottom system
CH 17, 19, 23, 27

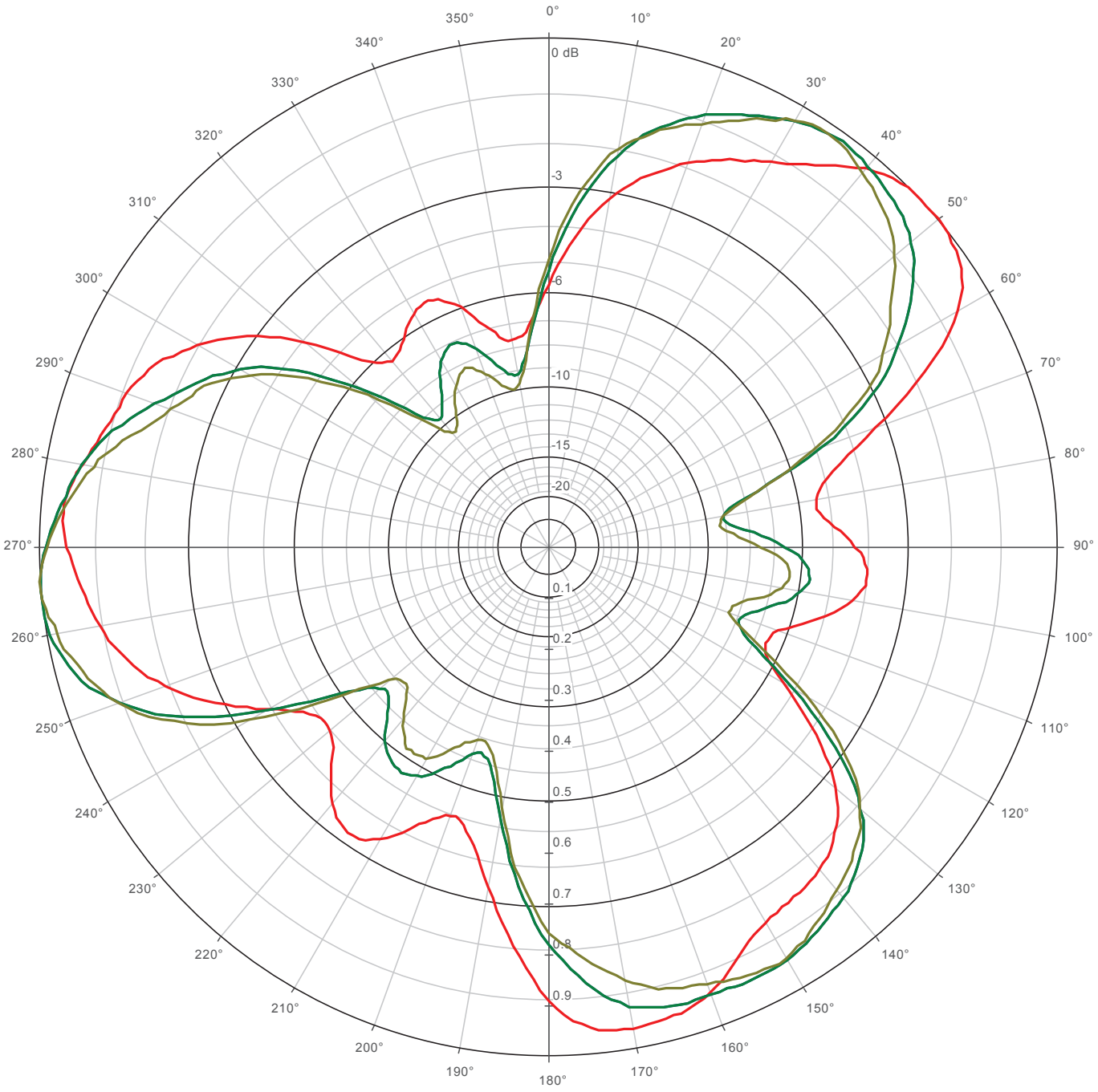
| KATHREIN | Horizontal Radiation Pattern<br>DTV Utah, azimuth comp, bottom Salt Lake City | Type:<br>759 25063 |
|---|---|---|




| | | | | |
|---|---|---|---|---|
| Frequency (MHz): | 491 | 503 | 527 | 551 |
| Azimuth: | 270° | 270° | 270° | 270° |

Bottom system
CH 17, 19, 23, 27

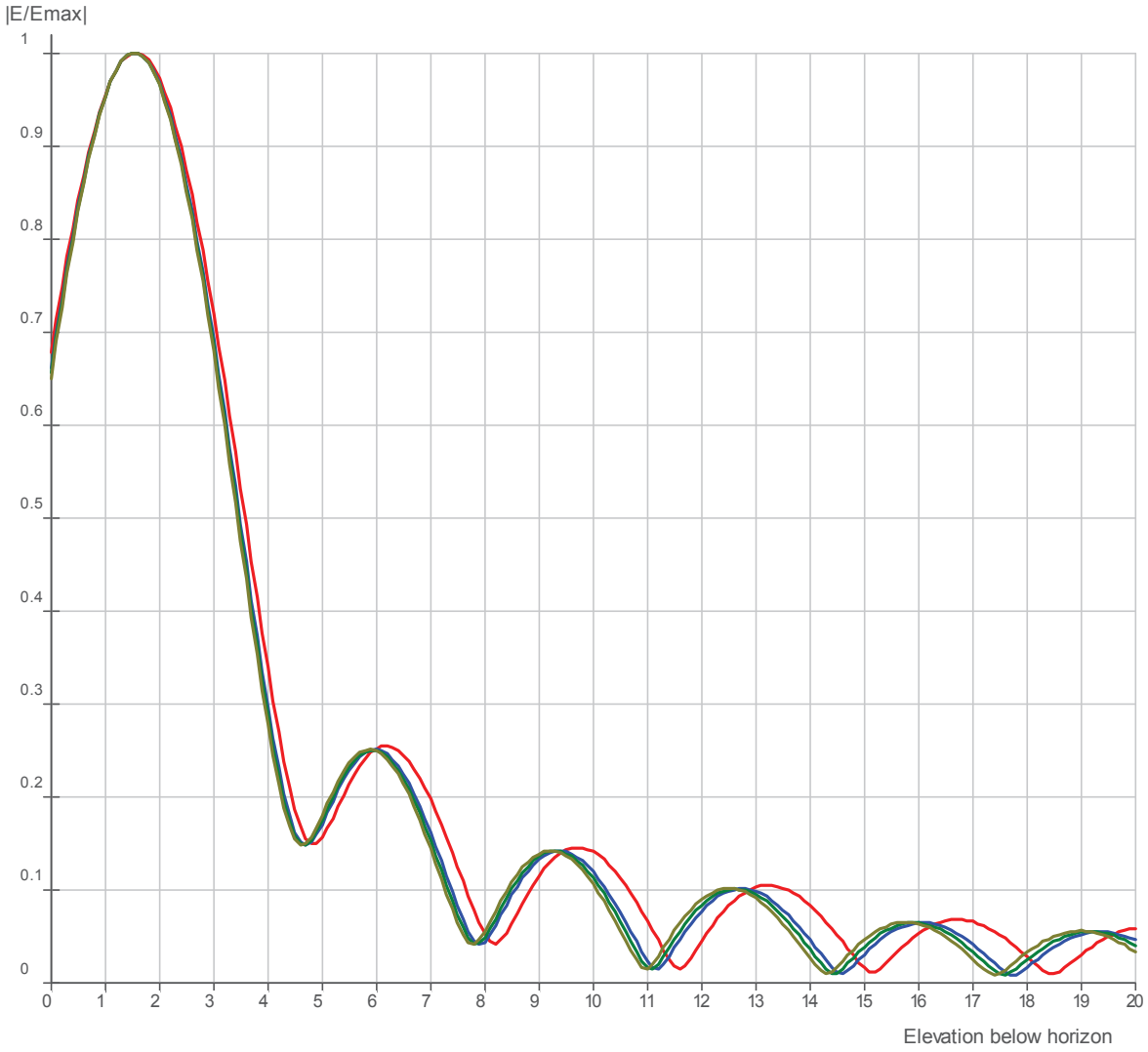
| | | |
|---|---|---|
| KATHREIN | Vertical Radiation Pattern<br>DTV Utah, azimuth comp, bottom Salt Lake City | Type:<br>759 25063 |




| Frequency (MHz): | 569 | 593 | 599 | 605 |
|---|---|---|---|---|
| Elevation below horizon: | 1.5° | 1.5° | 1.5° | 1.5° |

Top system
CH 30, 34, 35, 36

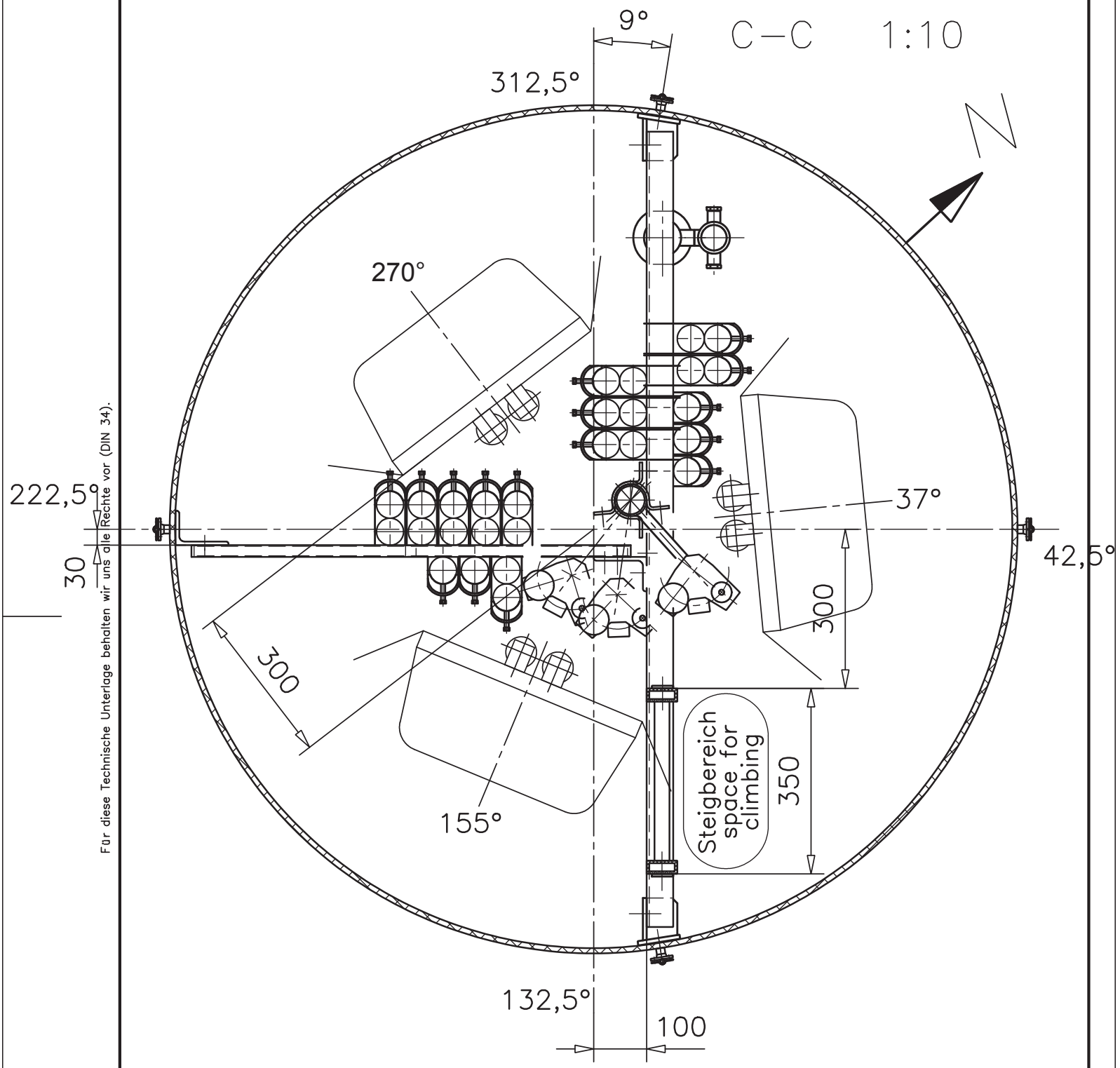
| KATHREIN | Horizontal Radiation Pattern<br>DTV Utah, azimuth comp, top Salt Lake City | Type:<br>759 25063 |
|---|---|---|




| | | | | |
|---|---|---|---|---|
| Frequency (MHz): | 569 | 593 | 599 | 605 |
| Azimuth: | 270° | 270° | 270° | 270° |

Top system
CH 30, 34, 35, 36

| | | |
|---|---|---|
| KATHREIN | **Vertical Radiation Pattern**<br>**DTV Utah, azimuth comp, top Salt Lake City** | Type:<br>**759 25063** |




Für diese Technische Unterlage behalten wir uns die Rechte vor (DIN 34).

| Allgemein–toleranz | Rohgewicht | Oberfl.: |
|---|---|---|
| | | |

| | Tag | Name |
|---|---|---|
| Bearb | 06.07.17 | S.Huber |
| Gepr. | | Seebacher |

| Aus–gabe | Aenderung | Tag | Name |
|---|---|---|---|

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E2449–375

Maßstab 1:10

Blatt 5

Database saved 06.07.2017 10:56:19 Hubers

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