2.6 Noise emission

2.6.1 General information

The MAGNETOM Prisma is equipped with a Sylomer-set as a standard configuration.

Tab. 20 Example od the section of the GGMR-Checklist

refer to GGMR checklist 3. Magnet Positioning	
Magnet installed on:	Comment
Sylomer-Set	standard delivery.

» The MR system generates a certain amount of noise, emitted as structure-borne noise or airborne noise.

The following tables provide information for calculating noise attenuation measures if required.

2.6.1.1 Regulations

Local regulations (e.g. VGB 121)

Refer to local regulations for noise protection.

Allowable noise level for operating personnel[1]	Room	Level
Limiting value related to 20 Pa sound pressure level	Operating room	</= 55 dB(A)
A-weighting average value over 8 h		</= 55 dB(A)
A-weighting average value over a sequence		</= 65 dB(A)

1. The noise level is valid for the operating personnel working in the operating room based on VGB 121.

Allowable noise level for neighbors	Level
Limiting value related to 20 Pa sound pressure level	</= 20/30 dB(A)
e.g., sick room, bedroom	
A-weighting average value over 8.0 h	</= 20 dB(A)
A-weighting average value over a sequence	</= 30 dB(A)
e.g., external office	

Allowable noise level for neighbors	Level
A-weighting average value over 8.0 h	</= 30 dB(A)
A-weighting average value over a sequence	</= 40 dB(A)

2.6.1.2 Acoustic noise cancellation

» If required, noise reduction should be realized based on the noise emission values as specified.

If noise exposure problems are to be expected, the RF-room manufacturer may be able to deliver noise reduction components for the RF-room.

For instance interior fitting, special RF window, RF door, etc.

You might consult a local acoustician or ifb Sorge.

Tab. 21 AcousticEngineer

Acoustic Engineer contact:	
Name	ifb Wolfgang Sorge
	Bureau for building physics
Street	Südwestpark 100
City	90449 Nürnberg
Country	Germany
Phone	+49 (0) 911 / 67047 - 0
E-mail	bauphysik@ifbsorge.de
URL	www.ifbsorge.de

Additional information regarding structural-borne noise is available and can be requested separately by e-mail at:

thomas.polster@siemens.com

bernhard.heinrich@siemens.com

2.6.2 Noise emission values

Tab. 22 Noise value

Acoustic noise emission Examination room	
Average value over 8.0 h inside the examination room including measurement tolerances.	Maximum noise value measured inside the examination room for calculating noise reduction measures.
84.4 dB(A)	101 dB(A)

Tab. 23 Noise value

Acoustic noise emission	
Equipment room	Operator room
</= 65 dB(A)	</= 55 dB(A)

Due to the active cooled (fan unit) gradient filters, the noise emmission produced by the fan units have to be taken in account.

To reduce the noise emission generated by the pressurized He-hoses use an adequate insulation surrounding the hoses!

Measures (e.g. insulation, covering) to reduce the noise emission might be taken into account.

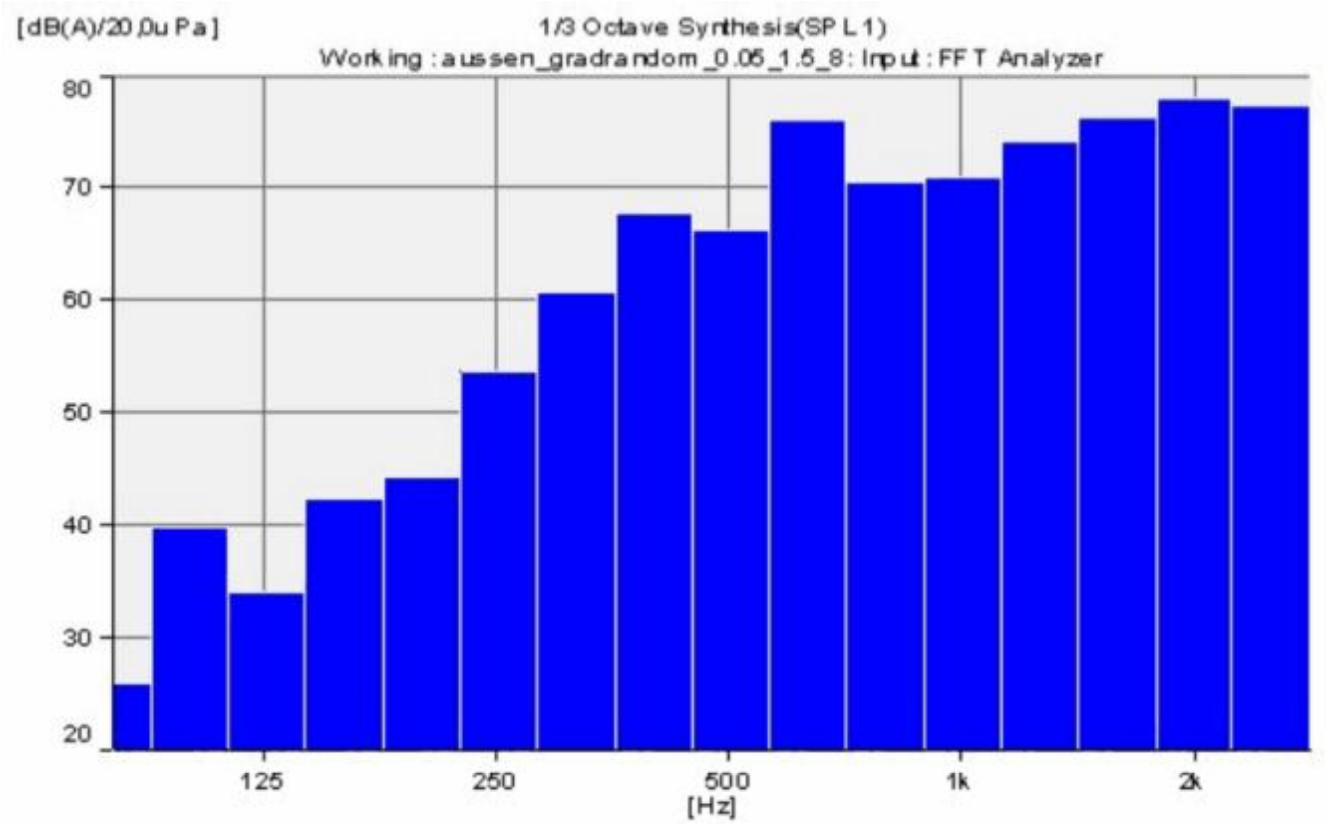
This takes place especially if the RF filter panel is installed above the operator console or in the close vicinity of the operator consol or in the operator room!

It is not recommended to install the RF filter panel above the operator console or in public areas (e.g hallway, waiting area).

2.6.2.1 Octave spectrum

The following spectrum is showing the noise characteristic of the MAGNETOM Prisma for the eight hour average. The characteristic for the maximum noise is identical with a general increase of + 18 dB to be applied for each frequency band.

Fig. 132: 1/3 Octave Spectrum



2.7 Gradient Stray Field

The diagram shows the magnetic stray field distribution of the gradient system along the patient axis of the MAGNETOM Prisma/Prismafit with the XR gradient system according to the requirements of the IEC 60601-2-33 standard.

The magnetic fields generated by each of the three orthogonal gradient axis are calculated on a coordinate grid on a virtual cylinder surface. The cylinder encompasses the patient axis and starts in the magnet isocenter.

The grid is defined by:

- a point pattern on the surface of a virtual cylinder with a diameter of 70 cm (i.e. max. bore liner);
- points on circles on the cylinder surface perpendicular to the cylinder axis with an azimutal step width of 10 degrees (i.e. 36 points at the circumference) and an axial step width of 4 cm.

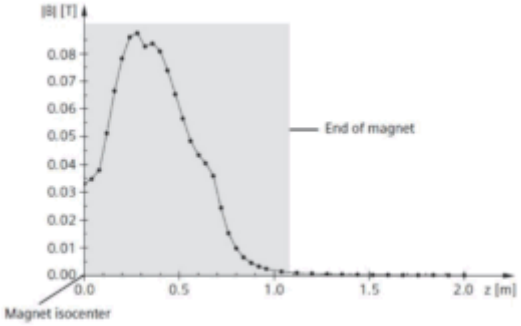
The field values are calculated at max. currents that can be handled by the gradient amplifiers. At each space point the field vectors generated by each gradient are calculated, superimposed and then their magnitudes are derived. The max. magnitude field value that can be found on each circle is selected and plotted along the z-axis.

By dividing the maximum field values by the shortest rise time, the dB/dt values can be derived.

Tab. 24 dB/dT value

Gradient	Shortest rise time	Max. dB/dt
XR gradient	400µs	87 mT/400 µs = 218 T/s

Fig. 133: The area shaded in grey indicates the length of the magnet



2.7.1 Spatial distribution of the gradient field at different positions inside the gradient coil

The diagram shows the spatial distribution of the maximum magnitude values of the vector sum of the field components generated by each of the three gradient units simultaneously at positions on virtual cylinders coaxial with the patient axis with diameters of 0.2 m, 0.4 m, and 0.5 m.

The virtual cylinders have the same length as the gradient coil. In the cylinder axis direction the points have a separation of 0.02 m.

Fig. 134: The area in grey indicates the length of the gradient coil